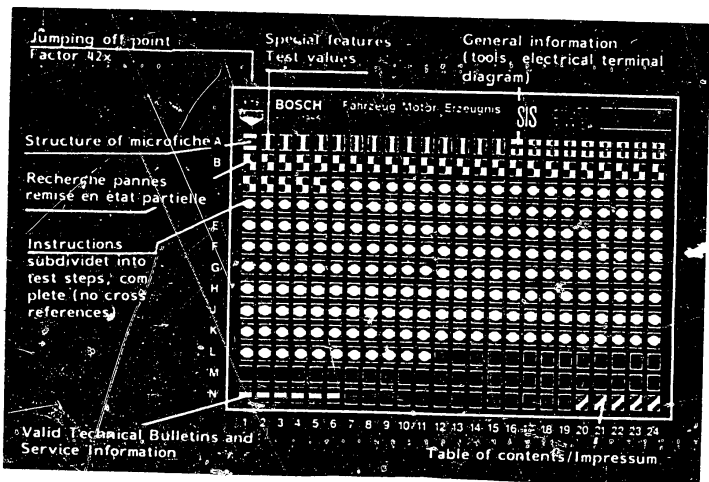
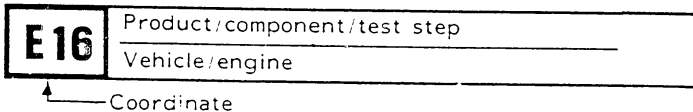


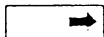
## Structure of microfiche



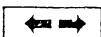
1. Read from left to right
2. Title of microfiche (appears on each coordinate)



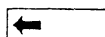
3. Limits of section



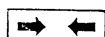
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.
5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

**A1**

Trouble-shooting program



## 1. Special features

These repair instructions relate to distributor-type fuel-injection pumps (VF..F..) 0 460 4.. with temperature-controlled starting fuel delivery (TAS), with temperature-controlled idle-speed increase (TLA), with temperature-controlled mechanical or hydraulic cold-start accelerator (KSB) with manifold-pressure compensator (LDA).

## 2. Test specifications

### 2.1 Test specifications - electrical

Check operation of solenoid-operated valve (freedom of movement). Apply voltage only for a short time.

**B5**

### 2.2 Leak tests

Housing cover

Test pressure 8 bar

Test duration max. 20 sec.

**C5**

Bottom part of control device

Test pressure 5 bar

**J17**

### 2.3 Tilting play

in both directions max. 0.25 mm

**C7**

### 2.4 Tightening torques

Nuts, bolts etc are itemized on drawings on the following coordinates.

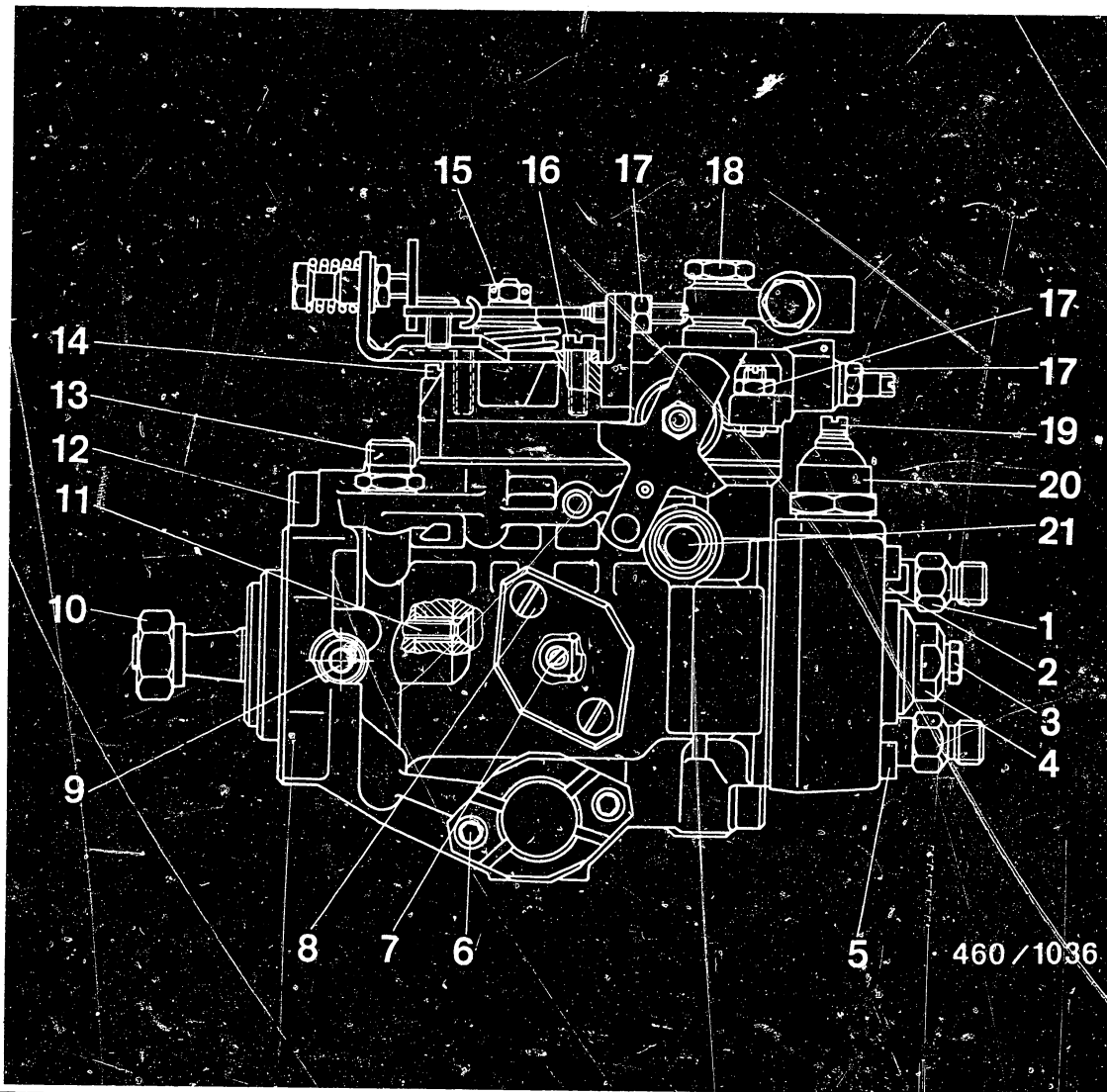
A list on the right-hand side repeats the individual items together with the coordinates under which you can find the tightening torque.

**A2**

Special features/test specs.

Distributor-type pump 0 460 4..





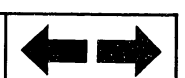
Item	Coordinates
1	A 11
2	A 11
3	A 11
4	A 11
5	A 11
6	A 11
7	A 11
8	A 11
9	A 11
10	A 11
11	A 11
12	A 11
13	A 12
14	A 12
15	A 12
16	A 12
17	A 12
18	A 12
19	A 12
20	A 12
21	A 12

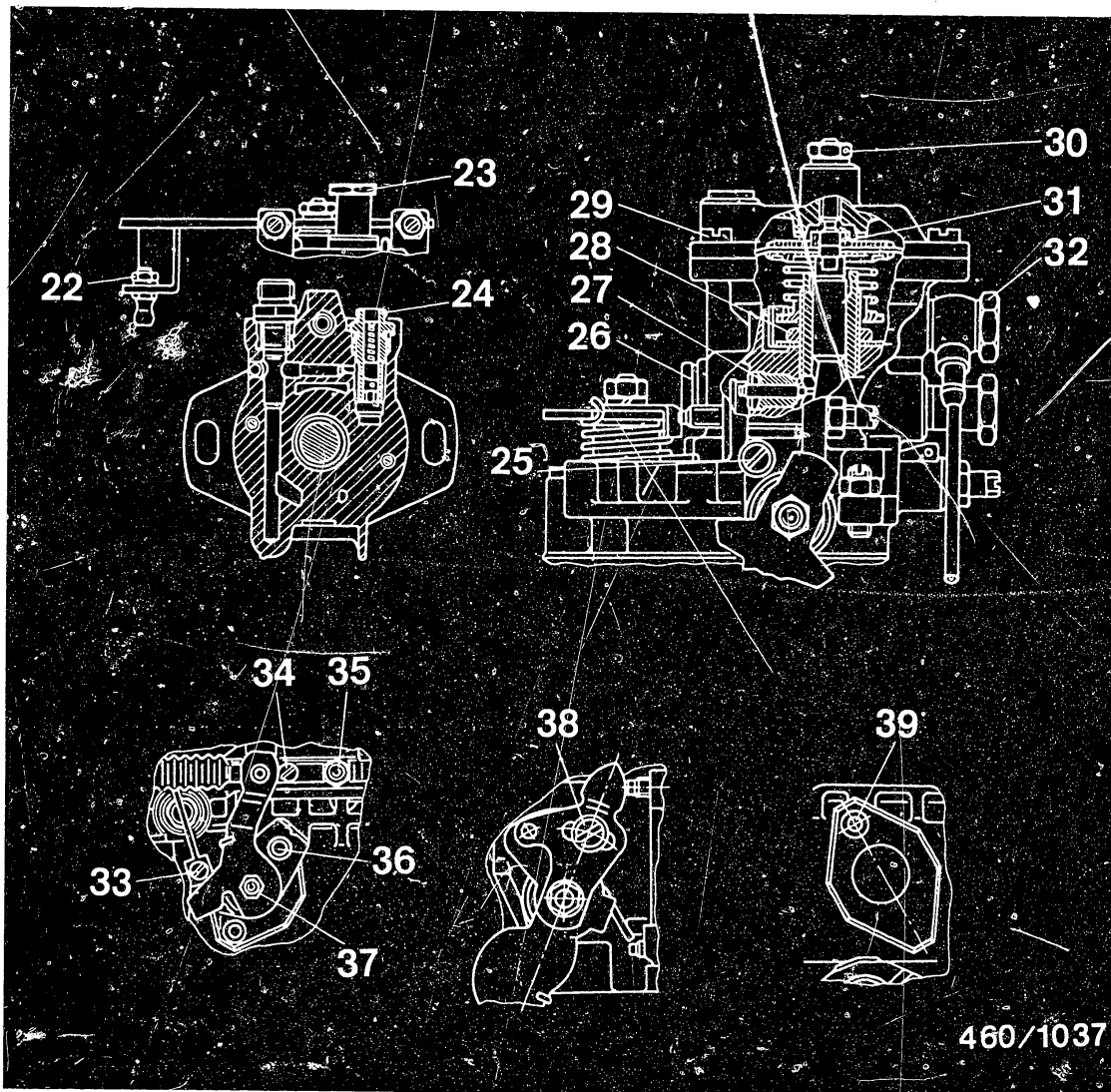
460 / 1036

**A3** Test specifications  
Distributor-type pump 0 460 4..



**A4** Test specifications  
Distributor-type pump 0 460 4..





Item	Coordinates
22	A 13
23	A 13
24	A 13
25	A 13
26	A 13
27	A 13
28	A 13
29	A 13
30	A 13
31	A 13
32	A 13
33	A 13
34	A 13
35	A 13
36	A 13
37	A 13
38	A 13
39	A 14

460/1037

**A5**

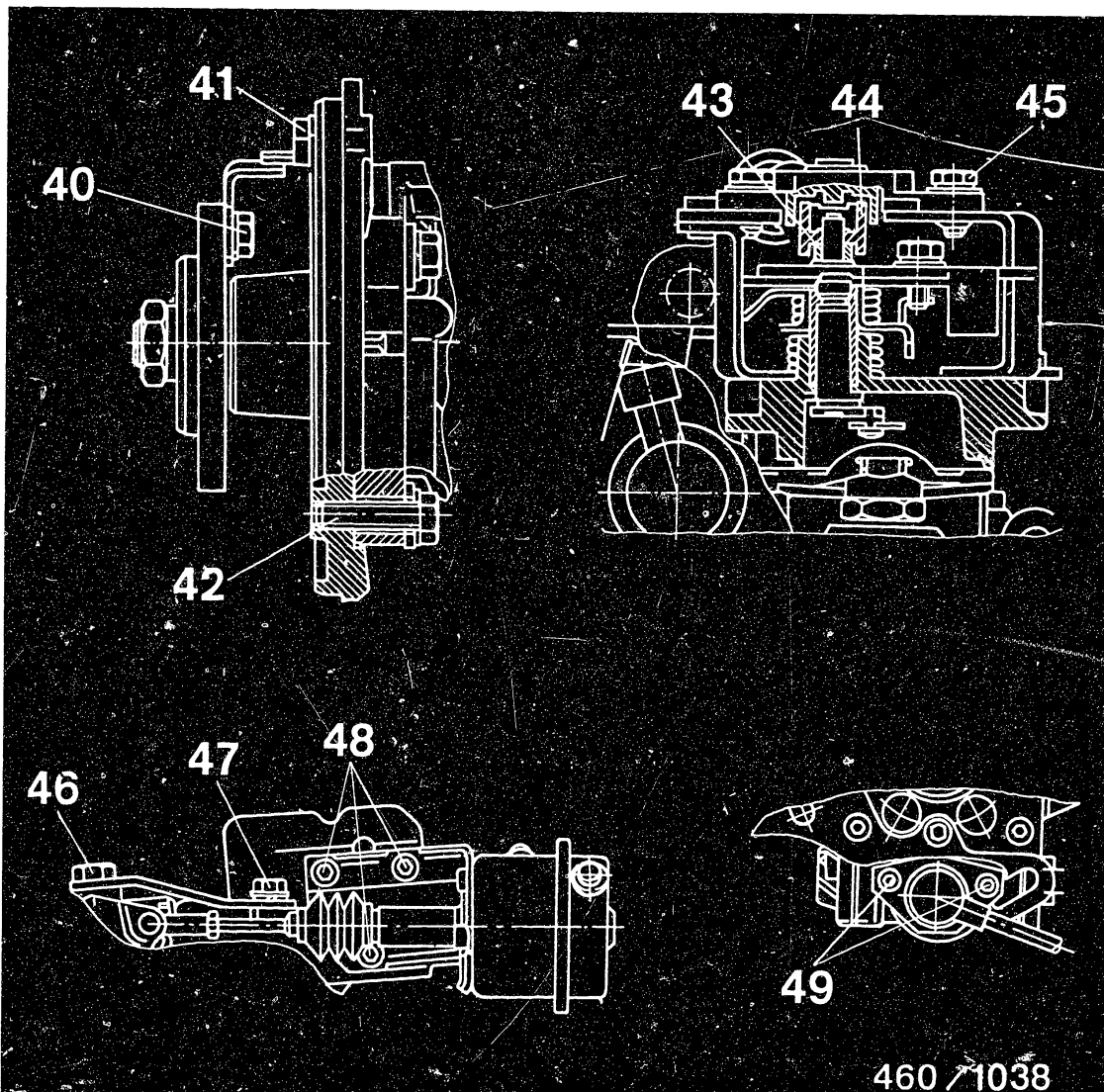
Test specifications  
Distributor-type pump 0 460 4..



**A6**

Test specifications  
Distributor-type pump 0 460 4..





Item

Coordinates

40	A 14
41	A 14
42	A 14
43	A 14
44	A 14
45	A 14
46	A 14
47	A 14
48	A 14
49	A 14

460 / 1038

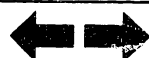
**A7**

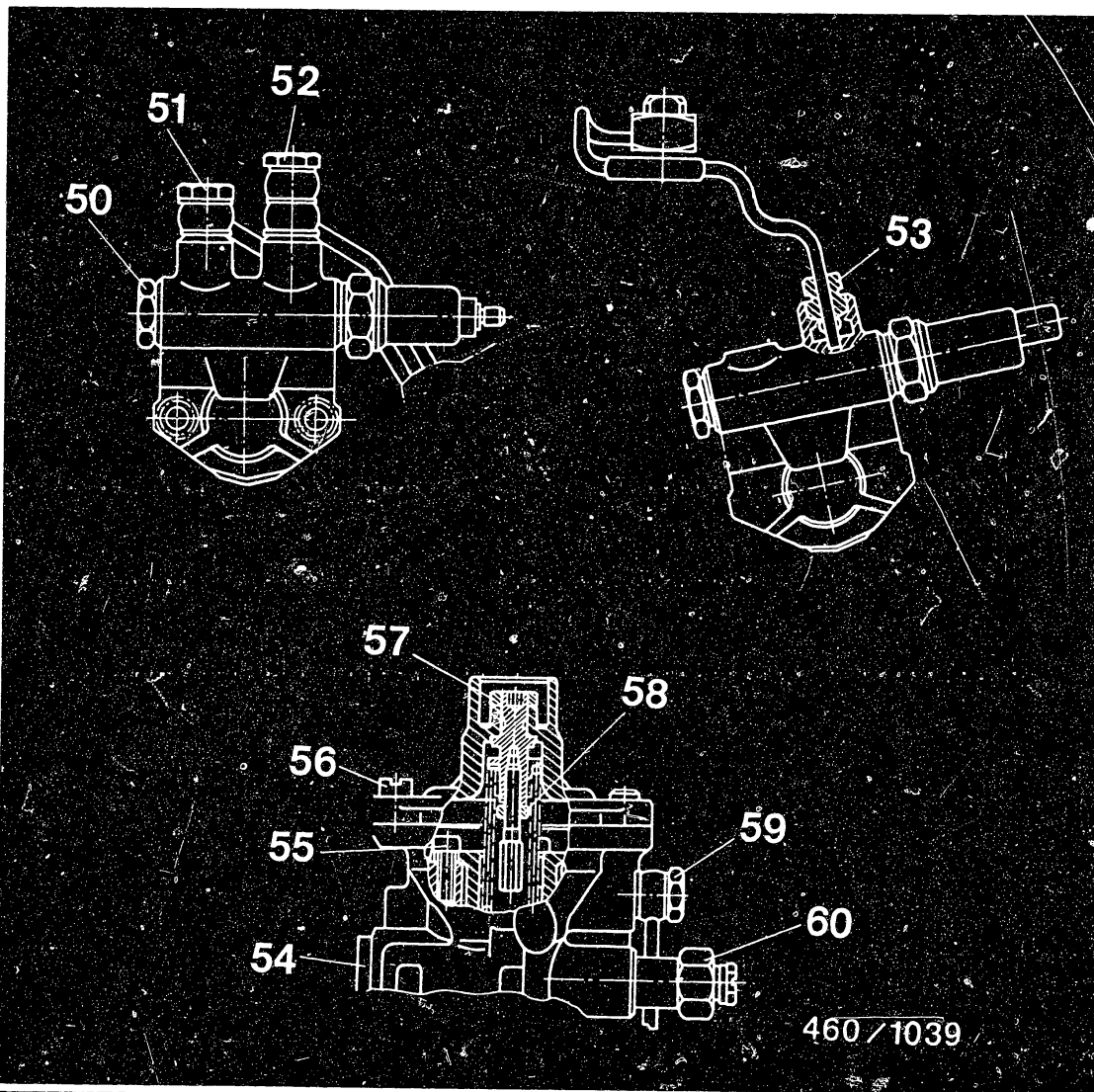
Test specifications  
Distributor-type pump 0 460 4..



**A8**

Test specifications  
Distributor-type pump 0 460 4..





Item	Coordinates
50	A 14
51	A 14
52	A 14
53	A 14
54	A 15
55	A 15
56	A 15
57	A 15
58	A 15
59	A 15
60	A 15

**A9**

Test specifications  
Distributor-type pump 0 460 4..



**A10**

Test specifications  
Distributor-type pump 0 460 4..



## Tightening torques

Item No.	Description	Nm	
1	Delivery-valve holder	38 ... 42 *	
		38 ... 48**	
2	Bleeder screw	3 ... 5	
3	Bleeder screw	20 ... 26	
4	Screw plug	70 ... 90	
5	Fillister-head screw/hexagon-socket-head cap screw	7 ... 10	
	Torx screw	10 ... 14	
6	Fillister-head screw	10 ... 14	
7	Fillister-head screw for pointer	2 ... 3	
8	Fillister-head screw	6 ... 9	
9	Locking screw	27 ... 35	
10	Hexagon nut		
	Part No.	Thread	Cone∅
	2 915 011 011	M 12	60...70   17
	2 915 021 004	M 14 x 1.5	80...100   20
	2 915 041 106	M 14 x 1.5	60...70   20
11	Flat-head screw for supply pump	2 ... 4	
12	Slotted round nut/hexagon nut	22 ... 30	

\* - Used delivery-valve holders

\* - New delivery-valve holders and new hydraulic head

**A11**

Test specifications

Distributor-type pump 0 460 4..



Item No.	Description	Nm
13	Tube fitting/or inlet-union screw	20 ... 30
14	Hexagon-socket-head cap screw/fillister-head screw	7 ... 10
15	Fastening nut for all control levers	5 ... 10
16	Hexagon-socket-head cap screw/fillister-head screw	7 ... 10
17	Hexagon nut	6 ... 9
18	Inlet-union screw with built-on overflow valve	1
19	Hexagon nut/fillister-head screw	1.5...2.5
20	Solenoid-operated valve	15 ... 25
21	Slotted shoulder screw	10 ... 15
22	Hexagon nut	3 ... 5
23	Inlet-union screw with built-on inlet union	20 ... 30
24	Pressure regulator	7 ... 10
25	Fillister-head screw	6 ... 8

**A12**

Test specifications

Distributor-type pump 0 460 4..





Item No.	Description	Nm
26	Screw plug	12 ... 16
27	Slotted round nut	8 ... 12
28	Hexagon nut	25 ... 35
29	Fillister-head screw/Torx	5 ... 8
30	Hexagon nut	6 ... 9
31	Hexagon nut	4 ... 6
32	Bleeder screw	10 ... 15
33	Fillister-head screw	3.0...4.5
34	Fillister-head screw	0.5...1.0
35	Hexagon nut	3.5...4.5
36	Hexagon-socket-head cap screw	6 ... 9
37	Hexagon nut	5 ... 10
38	Hexagon nut/ fillister-head screw	6 ... 9
39	Bleeder screw	3 ... 5
40	Hexagon screw	7 ... 10
41	Hexagon-socket-head cap screw	2 ... 3

**A13**

Test specifications

Distributor-type pump 0 460 4..



Item No.	Description	Nm
42	Hexagon screw	16 ... 24
43	Hexagon nut	7 ... 10
44	Round nut	5 ... 8
45	Hexagon nut	5 ... 8
45	Hexagon screw	10 ... 15
47	Hexagon screw	6 ... 9
48	Hexagon-socket-head cap screw	8 ... 10
49	Fillister-head/Torx screw	10 ... 14
50	Valve insert	10 ... 15
51	Inlet-union screw	8 ... 12
52	Inlet-union screw	8 ... 12
53	Retaining screw	6 ... 10
54	Screw plug	12 ... 16
55	Hexagon-socket-head cap screw	3 ... 5
56	Fillister-head screw	5 ... 8
57	Hexagon nut	6 ... 9

**A14**

Test specifications

Distributor-type pump 0 460 4..



Item No.	Description	Nm
58	Hexagon nut	3 ... 5
59	Inlet-union screw	8 ... 12
60	Inlet-union screw	20 ... 30

**A15**

Test specifications

Distributor-type pump 0 460 4..



### 3. General information

These repair instructions are divided into

- partial repair of distributor-type pump (without complete assembly) with trouble-shooting chart according to customer complaints
- complete repair of distributor-type pump.

#### Notes:

The distributor-type fuel-injection pumps VE 0 460 494 105 without manifold-pressure compensator (LDA) and 0 460 404 028 with manifold-pressure compensator (LDA) were used in preparing these repair instructions.

The various versions of pump are to be taken from the corresponding service-parts lists. Worn or damaged parts are to be discarded.

Sealing elements are always to be renewed.

The testing instructions for distributor-type pumps are on a separate microcard.

### 4. Cleaning the parts

Wash out the parts in low-inflammability, commercially-available cleaning agent e.g. Chlorothene NU. Then blow off with compressed air.

#### Observe the following safety regulations

Decree on working with inflammable liquids (Vbf) issued by the Federal Ministry of Labor (BmA).

Safety rules on handling chlorinated hydrocarbons

for the workshop ZH 1 / 222

for the employee ZH 1 / 119

issued by the Central Association of German Employers' Liability Insurance Associations (Central Association for Accident Prevention and Industrial Medicine)

Langwartweg 103, 5300 Bonn 5.

In countries outside the Federal Republic of Germany, observe the corresponding local regulations.



## 5. Tools

Tool	Type designation/part number	Use
Prestroke measuring device	1 688 130 045 previously EFEP 462 or KDEP 2931	Setting the prestroke
with extension	1 683 458 019	Thread M 8 x 1
Measuring tool with dial indicator	KDEP 1088  1 687 233 012	Setting dimensions "K" and "KF"  With measuring base thread M 3
Setting tool	KDEP 1082	For governor shaft with slotted round nut
Assembly device	KDEP 1109	Assembling the control device
Pin wrench	KDEP 1110	Assembling the control device
Assembly tool	KDEP 1097	Removing and installing the supply pump
Protective capsule	KDEP 1100	Holding the cam roller ring
Assembly shell	KDEP 1101	Holding the supply pump
Socket wrench	KDEP 1087	Loosening and tightening the slotted shoulder screws
Assembly wrench	KDEP 1096	Mounting the control-lever shaft in the housing cover
Measuring tool	KDEP 1088	Measuring dimension C

**A17**

Tools

Distributor-type pump 0 460 4..



Tool	Type designation/part number	Use
Clamping support	KDEP 2919 (EF 8498 C)	Mounting the distributor-type injection pump
Support clamp	KDEP 2963	
Flange	1 685 720 062	VE.. with 2- and 3-hole flange
Coupling	1 416 430 012	Cone dia. 17 mm (extra-long version)
Assembly sleeve	KDEP 2939	Protecting the radial-lip-type oil seal when installing the drive shaft (cone dia. 17 mm)
Assembly sleeve	KDEP 2937	Protecting the O-ring when mounting on setting shaft/lever shaft
Extractor hook	KDEP 2938	Removing the seal rings
Wrench	KDEP 1080	For central screw plug
Socket wrench	KDEP 1086	For control valve
Spacer	KDEP 1084	Measuring dimension "MS"
Screw-driver bit	KDEP 1090	Loosening and fastening the slotted round nut
Clamping fixture	KDEP 1102	Clamping the sliding bolt
Aligning pin	KDEP 1103	Adjusting the bearing bushing

**A18**

Tools

Distributor-type pump 0 460 4..



Tool	Type designation/part number	Use
Puller	KDEP 1104	Extracting the bearing bushing
Measuring sleeve	KDEP 1105	Determining dimension "E"
Dial-indicator holder	KDEP 1128 or KDEP 1146	Holding the dial indicator when measuring the tilting play
Aligning pin	KDEP 1125	Adjusting the bearing bushing
Spacer	KDEP 1130	Coordinating the stop lever and lever shaft
Puller	KDEP 1113 KDEP 1114	Extracting the radial-lip-type oil seal
Puller	KDEP 1131	Dismantling the drive pinion
Press-in and out tool	KDEP 1132	Replacing the bearing bushing

**A19**

Tools

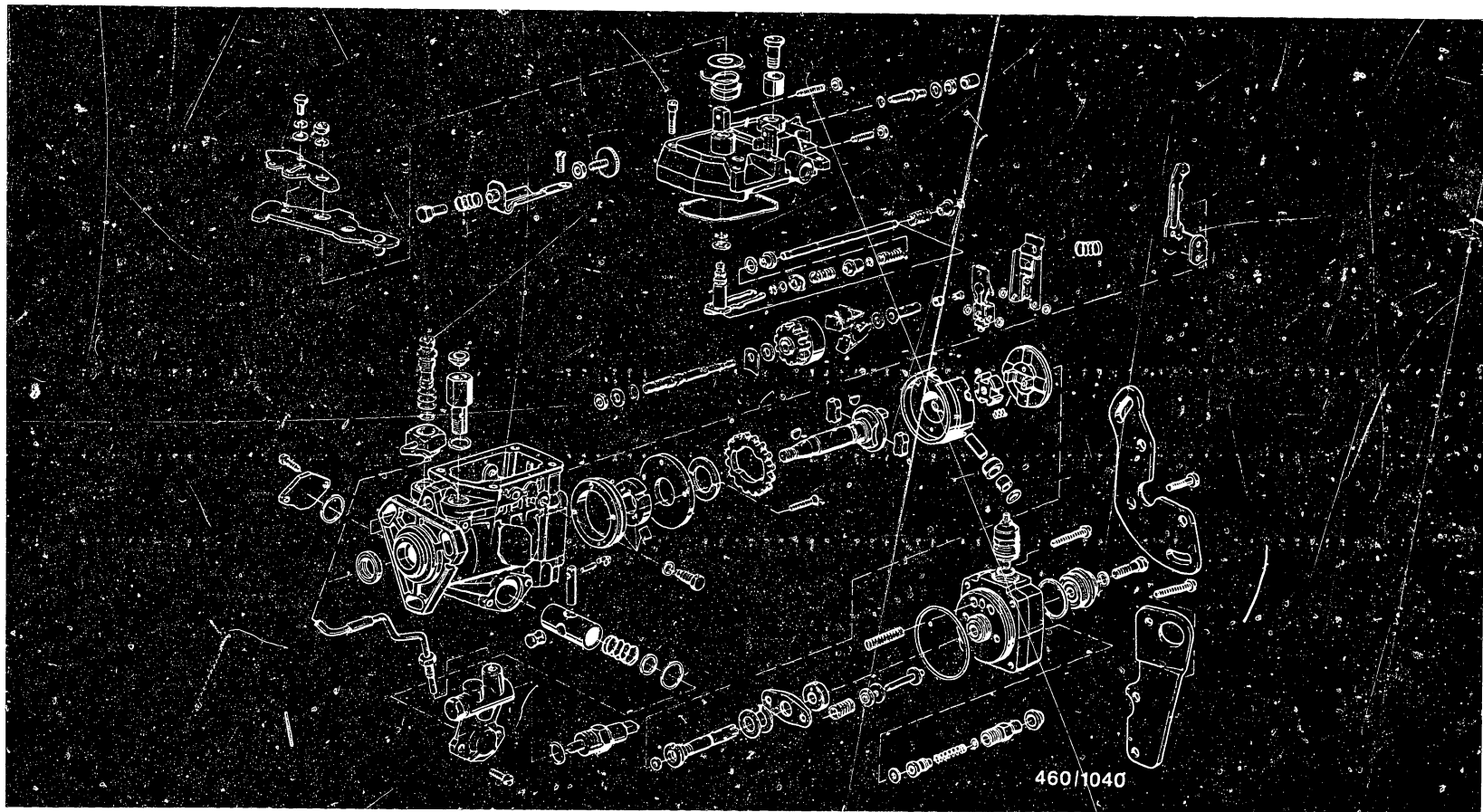
Distributor-type pump 0 460 4..



Tool	Part number	Use	
Screw-driver bits for torque wrench 1/2 inch square	Hahn & Kolb No. 52 518-030	For screws with socket-Torx head M 6	
	Hazet No. 992 - T 30	Mounting of hydraulic head, housing cover and timing-device cover	
	Wera - Kraft No. 767 C - TX30		
	Hahn & Kolb No. 52 518-027		For screws with socket-Torx head M 5
	Hazet No. 992 - T 27	Adjusting screw in manifold-pressure compensator (LDA) cover	
	Wera-Kraft No. 767 - TX 27		
	Hahn & Kolb No. 52 516-060		For screws with internally-serrated head XZN (M 6)
	Molykote paste	Hazet No. 990-6	Mounting of timing-device cover (e.g. IHC engines)
		Wera-Kraft No. 760 C-M6/52	
Ft 70 v 1		Guide pin in LDA housing	
Special oil	Shell Glavus G 32		



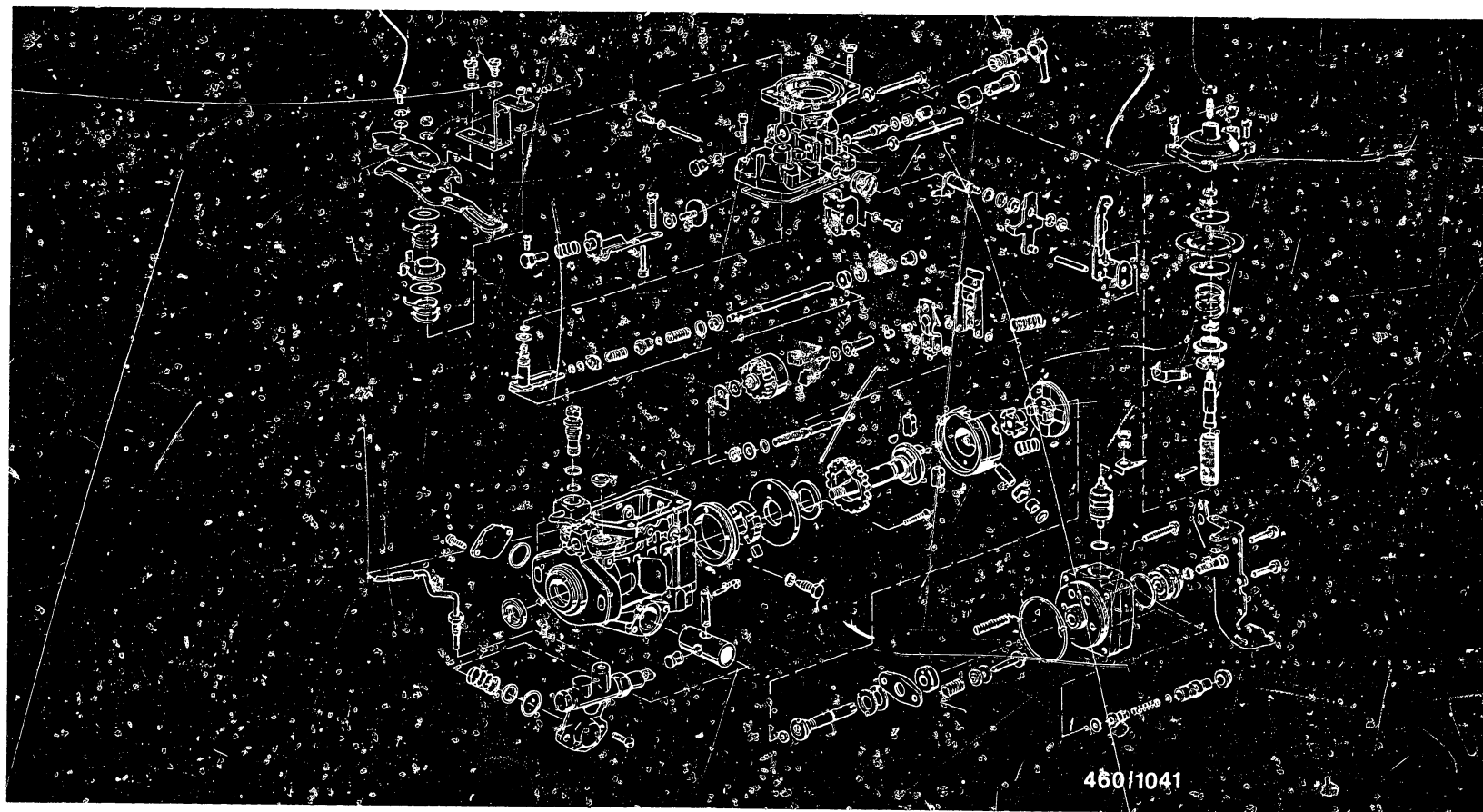




6. Exploded view of distributor-type fuel-injection pump (VE) 0 460 494 105 without manifold-pressure compensator (LDA)

<b>A21</b>	Exploded view Distributor-type pump 0 460 4..	➔
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<b>A22</b>	Exploded view Distributor-type pump 0 460 4..	➔➔
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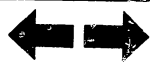


6.1 Exploded view of distributor-type fuel-injection pump (VE) 0 460 404 028 with manifold-pressure compensator (LDA)

**A23**

Exploded view

Distributor-type pump 0 460 4..



**A24**

Exploded view

Distributor-type pump 0 460 4..



## 7. Trouble-shooting chart for partial repair

If there is no customer complaint/no fault symptom, it is advisable to perform a receiving inspection on the test bench.

### 7.1 Customer complaint (fault symptom)

1. Engine starts poorly
  2. White smoke from engine, no throttle response (pump overheating)
    3. Engine will not stop
      4. Control lever does not return to idle stop
        5. Engine shakes when idling

				Cause of trouble	Coordinates
●				Central screw plug defective	B 3
	●			Overflow restriction clogged (screws mixed up)	B 4
		●		Solenoid-operated valve (shutoff solenoid) defective	B 5
			●	Lack of lubricating grease on spring, stop bushing and cover	B 6
			●	Leaks at delivery-valve holder and bleeder screw	B 7
			●	Radial-lip-type oil seal defective	B 8
			●	Timing-device seal ring defective	B 9
			●	Housing cover seal, control-lever bushing, O-ring defective	B 10

**B1**

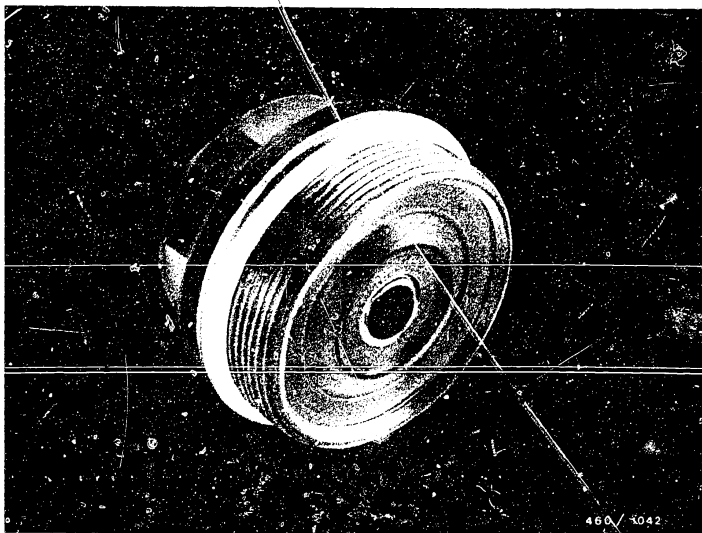
Trouble-shooting chart - partial repair  
Distributor-type pump 0 460 4..



**B2**

Trouble-shooting chart - partial repair  
Distributor-type pump 0 460 4..





## 7.2 Partial repair

### 7.2.1 Checking the central screw plug

If distributor-type pump leaking at central screw plug, check the tightening torque.

Should be max. 70 ... 90 Nm.

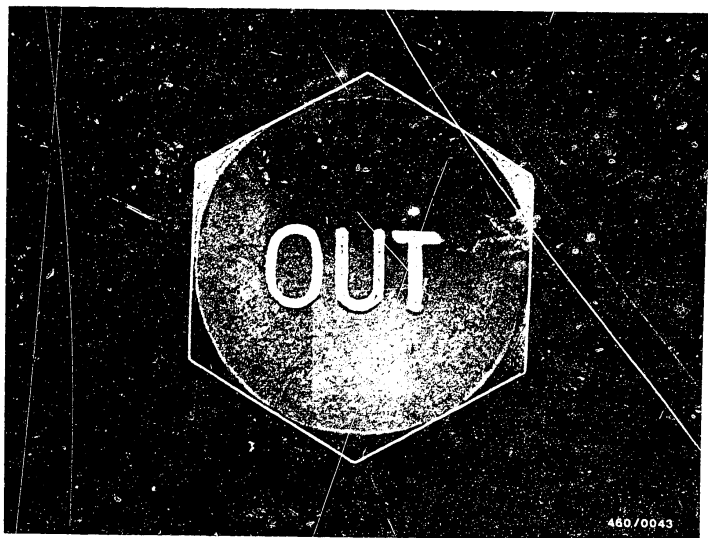
If tightening torque correct, replace central screw plug (leaking internally).

**B3**

Partial repair

Distributor-type pump 0 460 4..





### 7.2.2 Checking the overflow restriction

Unscrew overflow restriction on injection pump (marked "out").

Visually examine the built-in wire filter for dirt.

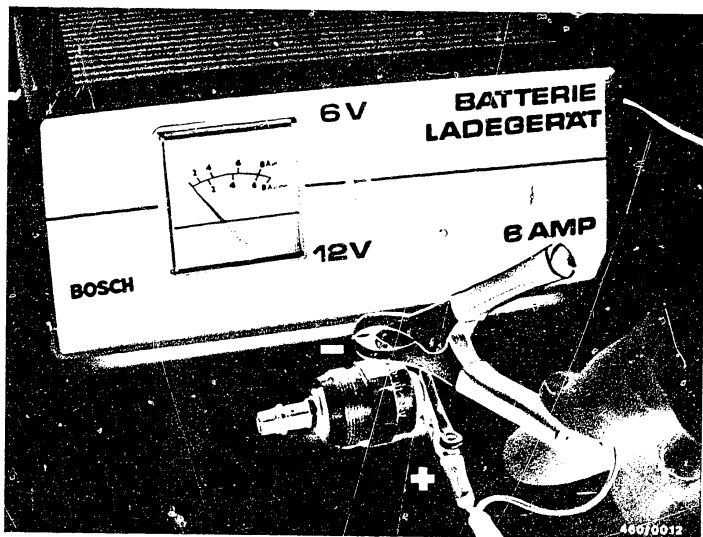
If in doubt, replace the overflow restriction.

**B4**

Partial repair

Distributor-type pump 0 460 4..





### 7.2.3 Checking the operation of the solenoid-operated valve

Remove the injection lines and take out the solenoid-operated valve.

Cleanliness is essential.

When removed, check the operation of the solenoid-operated valve (see picture).

Note:

When removed, the solenoid-operated valve may only be supplied with voltage for a short time since it is not being cooled by the fuel.

**B5**

Partial repair

Distributor-type pump 0 460 4..



#### 7.2.4 Control lever not returning to idle stop

The cause of the trouble is inadequate lubrication at cylindrical helical coiled spring, stop bushing and cover.

The lubricating grease may have been washed off at these places, e.g. during engine washing.

If this is so, the control lever, cylindrical helical coiled spring and stop bushing must be properly re-greased with multi-grade grease (if need be, it is also possible to use engine oil for lubrication).

**B6**

Partial repair

Distributor-type pump 0 460 4..



### 7.2.5 Checking and eliminating leaks at delivery-valve holder and bleeder screw

If delivery-valve holder leaking, loosen delivery-valve holder and tighten delivery-valve holder to specified tightening torque 38 ... 42 Nm.

If delivery-valve holder is still leaking, replace delivery-valve holder and gasket.  
Make sure that delivery valves with springs and shims are re-installed in the same outlet.  
Do not get the parts dirty.

Delivery-valve holders to be tightened only with a torque wrench.

If bleeder screw in central screw plug is leaking, replace seal.  
Tighten bleeder screw to tightening torque 20 ... 26 Nm.

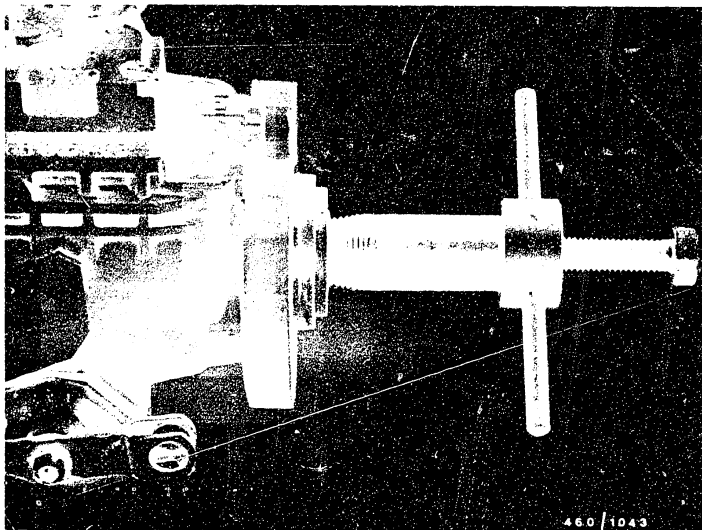
**B7**

Partial repair

Distributor-type pump 0 460 4..







### 7.2.6 Replacing the radial-lip-type oil seal

Pull radial-lip-type oil seal out of pump housing using puller KDEP 1113 or KDEP 1114.

Mount assembly sleeve KDEP 2939 on drive shaft.

Install new radial-lip-type oil seal using arbor press.

Note:

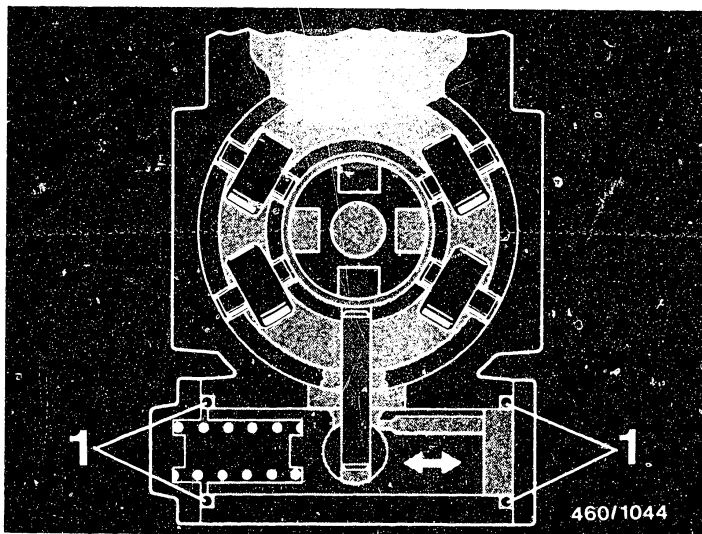
Do not damage sealing lip or seal ring spring.

**B8**

Partial repair

Distributor-type pump 0 460 4..





1 = O-rings

### 7.2.7 Replacing the timing-device seal rings (O-rings)

Remove the timing-device cover.

Check O-rings for damage.

Replace O-ring if damaged.

Re-mount timing-device cover.

#### Note:

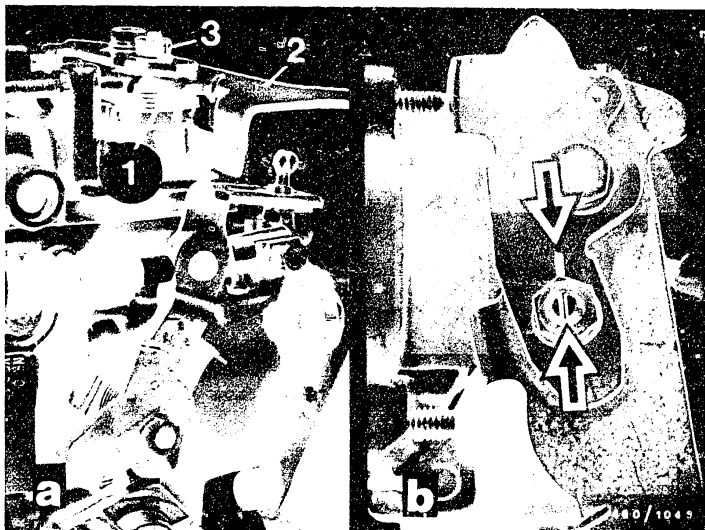
If a cold-start accelerator (KSB) is mounted on the pressure side of the timing device, remove it beforehand.

**B9**

Partial repair

Distributor-type pump 0 460 4..





1 = Cylindrical helical  
coiled spring  
2 = Control lever

3 = Hexagon nut with spring  
lock washer

### 7.2.8 Replacing the housing cover seal ring, control-lever bushing and O-ring on control lever shaft

- Remove and dismantle housing cover

Distributor-type injection pump with variable-speed governor

Remove overflow restriction (OUT).

Drain distributor-type pump.

Mount distributor-type pump on clamping support.

Unhook cylindrical helical coiled spring.

Mark control lever and control lever shaft in relation to each other (see arrows, picture b).

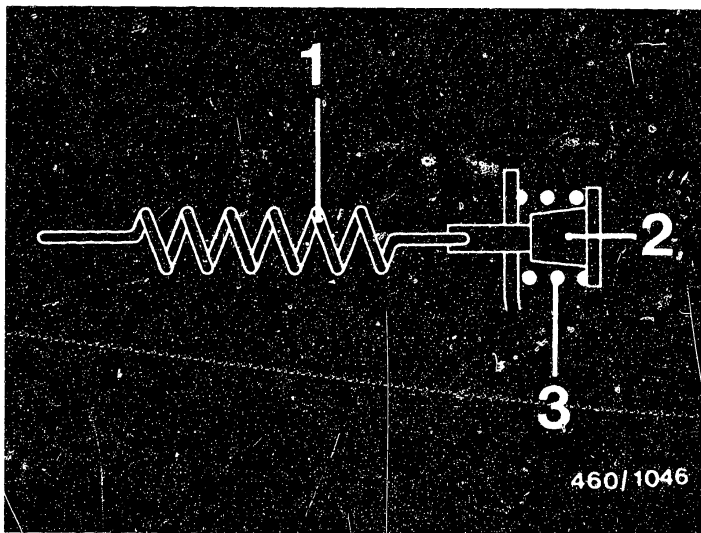
Remove cover fastening screws.

**B10**

Partial repair

Distributor-type pump 0 460 4..





1 = Extension spring  
2 = Retaining pin

3 = Compression spring

Raise housing cover and unhook extension spring from retaining pin.

Put down retaining pin with compression spring.

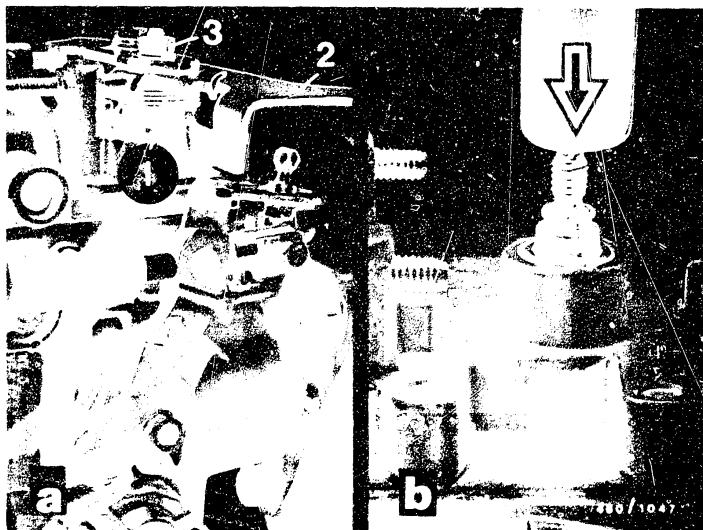
Unhook extension spring from control lever shaft.

**B11**

Partial repair

Distributor-type pump 0 460 4..





1 = Cylindrical helical  
coiled spring  
2 = Control lever

3 = Hexagon nut with spring  
lock washer

Remove hexagon nut with spring lock washer and pull off control lever (see picture a).

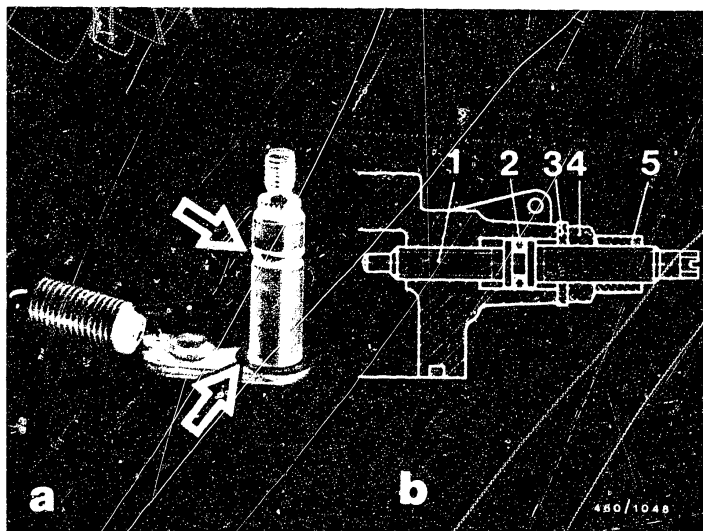
Press control lever shaft through toward inside of cover e.g. using handle of screwdriver (see picture b).

**B 12**

Partial repair

Distributor-type pump 0 460 4..





Picture b

- |                  |                      |
|------------------|----------------------|
| 1 = Threaded pin | 3 = Plain washer     |
| 2 = O-ring       | 4 = Hexagon nut      |
|                  | 5 = Retaining sleeve |

Remove O-ring and shim from control lever shaft (see arrows, picture a).

Remove housing cover.

Take seal ring out of housing cover (not shown).

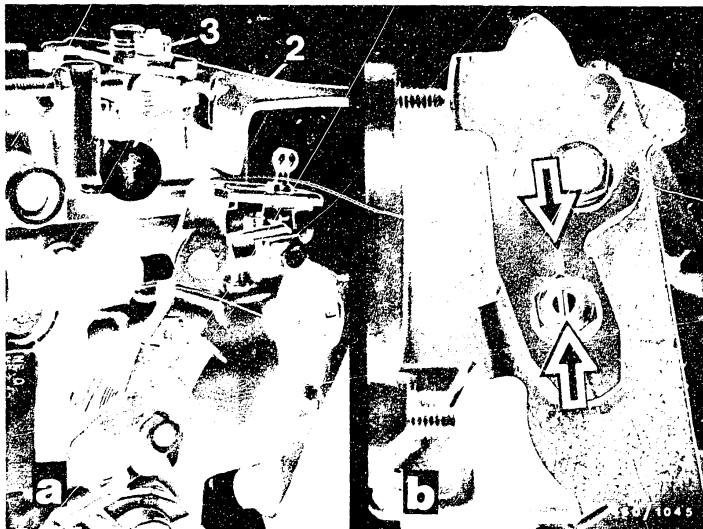
Remove threaded pin with hexagon nut, plain washer, retaining sleeve and O-ring (see picture b).

**B 13**

Partial repair

Distributor-type pump 0 460 4..





1 = Cylindrical helical  
coiled spring  
2 = Control lever

3 = Hexagon nut with spring  
lock washer

● Removing and dismantling the housing cover

Distributor-type fuel-injection pump with part-load governor

Remove overflow restriction (OUT).

Drain distributor-type injection pump.

Mount distributor-type injection pump on clamping support.

Unhook cylindrical helical coiled spring.

Mark control lever and control lever shaft in relation to each other (see arrows, picture b).

Remove hexagon nut with spring lock washer and pull off control lever.

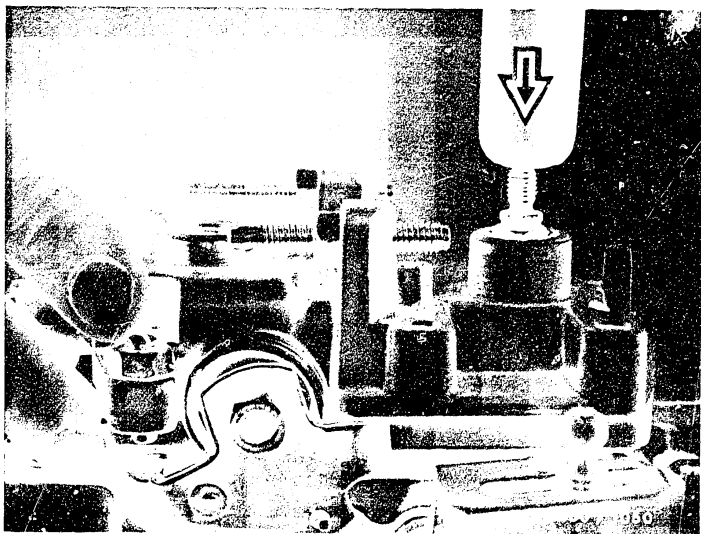
Remove cover fastening screws.

**B14**

Partial repair

Distributor-type pump 0 460 4..





Press control lever shaft through toward inside of cover, e.g. using handle of screwdriver (see picture).

To do this, it may be necessary to raise the cover slightly.

Remove housing cover.

Pay attention to locating pin.

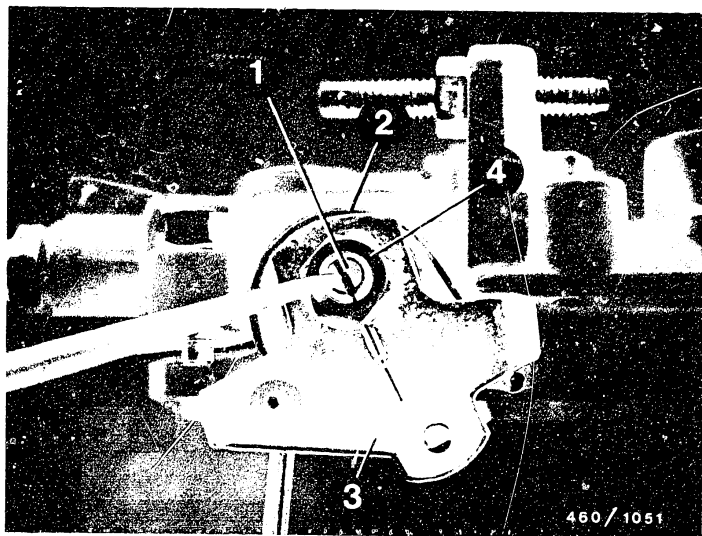
**B 15**

Partial repair

Distributor-type pump 0 460 4..







460/1051

- |  |  |
|--|--|
| 1 = Lever shaft                          | 3 = Regulating lever                       |
| 2 = Cylindrical helical<br>coiled spring | 4 = Hexagon nut with spring<br>lock washer |

The following text applies to injection pumps with variable-speed governor and part-load governor.

Removing the temperature-controlled starting fuel delivery limitation (TAS)

Unhook cylindrical helical coiled spring (if applicable).  
Mark position of regulating lever/stop lever in case of mechanical shutoff in relation to lever shaft (see picture).

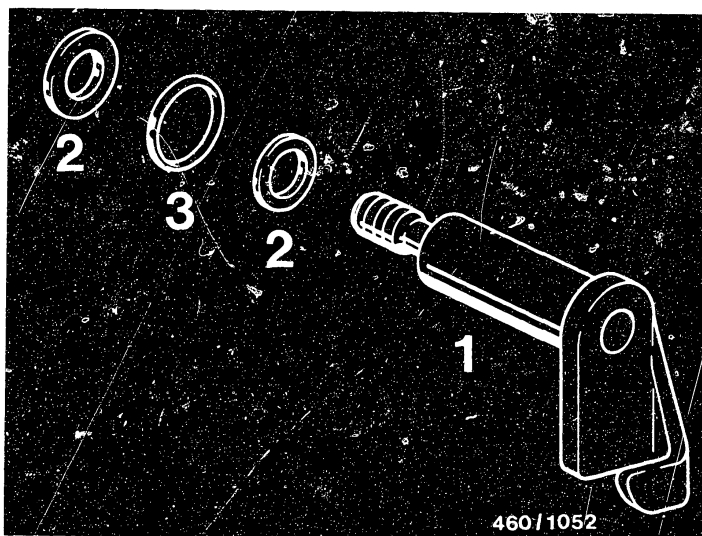
Remove hexagon nut with spring lock washer.  
Pull off regulating lever.

**B 16**

Partial repair

Distributor-type pump 0 460 4..





1 = Lever shaft  
2 = Shims

3 = O-ring

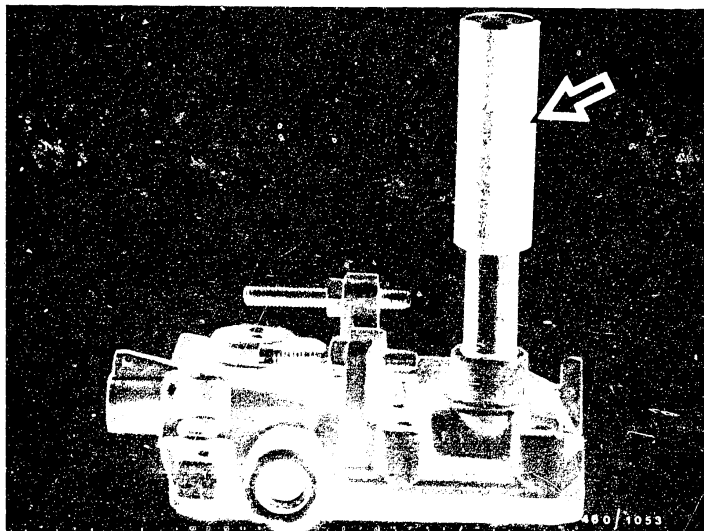
Pull lever shaft out of housing cover.

Remove shims and O-ring.

**B17**

Partial repair  
Distributor-type pump 0 460 4..





### Replacing the control lever bushing

Insert clamping pin KDLJ 6010 in press-out and in mandrel (arrow).

Press out bronze bushing on arbor press.

Wash out housing cover; bore for bushing must be free of grease.

Check bore in housing cover for longitudinal score marks or similar damage.

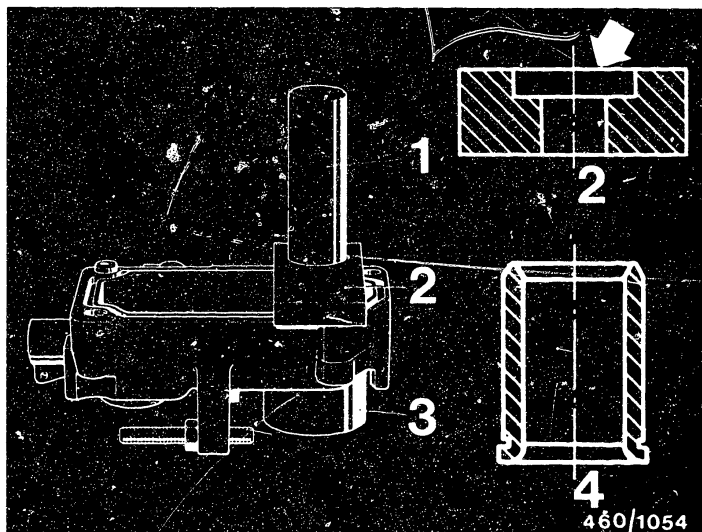
If freedom from leaks between bushing and housing cover bore does not appear guaranteed, use a new housing cover.

**B18**

Partial repair

Distributor-type pump 0 460 4...





- 1 = Press-in mandrel      3 = Support ring  
 2 = Spacer plate      4 = Steel bushing (short)

Position housing cover on support ring. Use long support ring for housing cover with manifold-pressure compensator, otherwise a short support ring.

Apply "Loctite 582" to outside diameter of steel bushing.

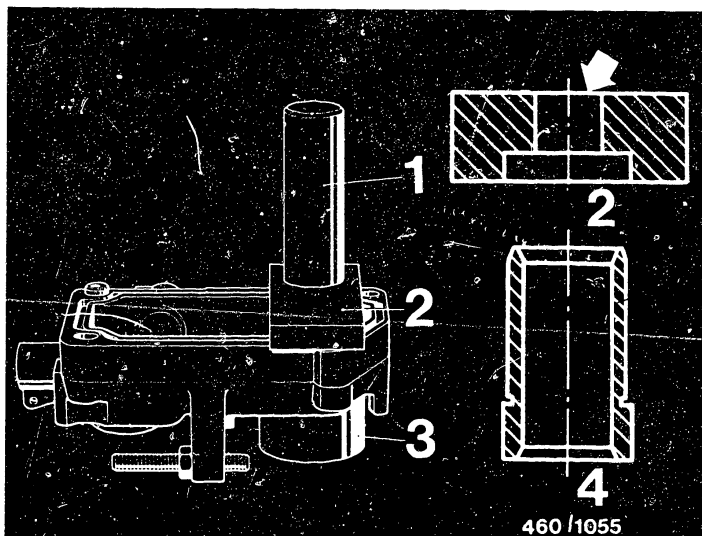
- Using press-in mandrel, press in steel bushing (short version) straight and flush until mandrel rests in recess of spacer plate side 2 (see picture, arrow).

**B19**

Partial repair

Distributor-type pump 0 460 4..





- 1 = Press-in mandrel      3 = Support ring  
 2 = Spacer plate          4 = Steel bushing (long)

- Using press-in mandrel, press in steel bushing (long version) straight and flush until mandrel rests on spacer plate side 1 (see picture, arrow).

Note:

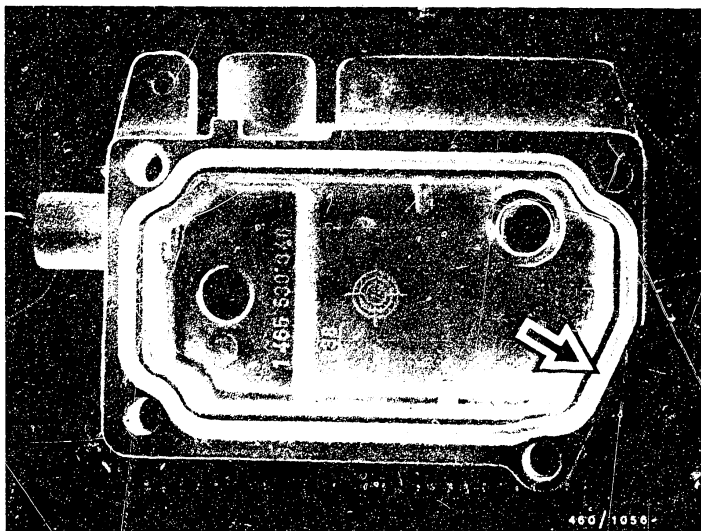
New steel bushings have a groove on the outside diameter.

**B20**

Partial repair

Distributor-type pump 0 460 4..





Insert new seal ring (see picture, arrow) in housing cover.

Pimples on circumference of seal ring prevent dropping out when mounting the housing cover,

Note:

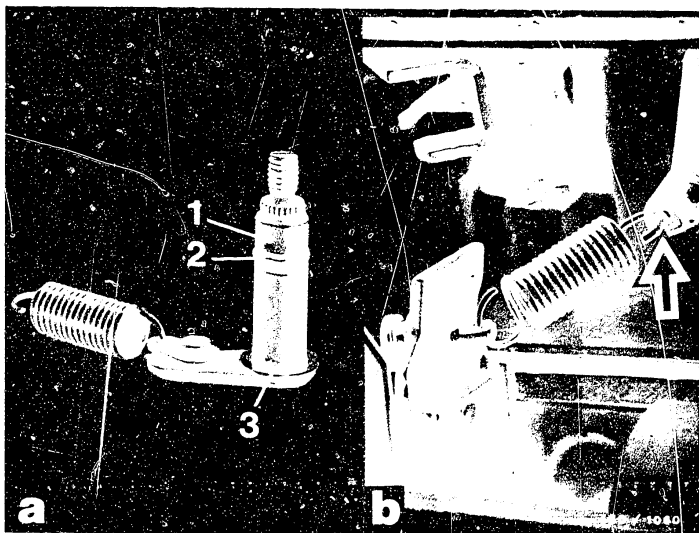
Seal rings without pimples can be used up.

**B21**

Partial repair

Distributor-type pump 0 460 4..





1 = Control lever shaft    3 = Shim  
 2 = O-ring

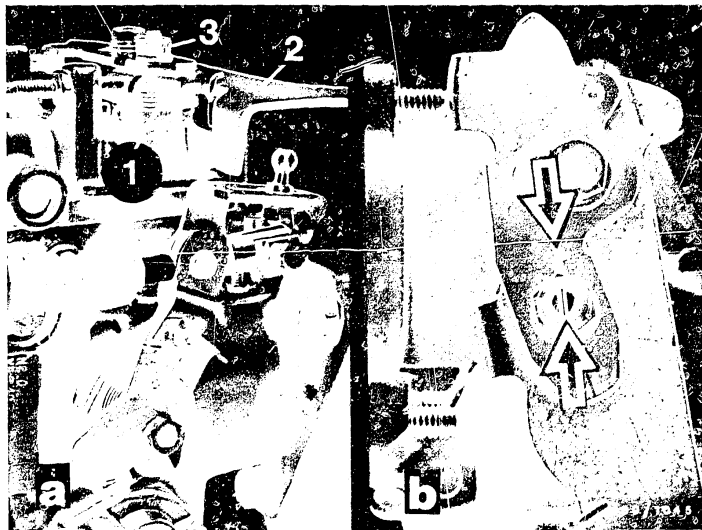
### 7.2.9 Assembling and mounting the housing cover (Variable-speed governor)

Slip shim onto control lever shaft. Mount O-ring with assembly sleeve KDEP 2987.

Pull control lever shaft through housing cover with assembly wrench KDEP 1096.

Hook extension spring into control lever shaft so that the eye opening points downward (see picture b, arrow).





- 1 = Cylindrical helical coiled spring  
2 = Control lever  
3 = Hexagon nut with spring lock washer

Mount cylindrical helical coiled spring with shim, control lever, spring lock washer and hexagon nut, thereby positioning the control lever parallel to the lever of the control lever shaft,

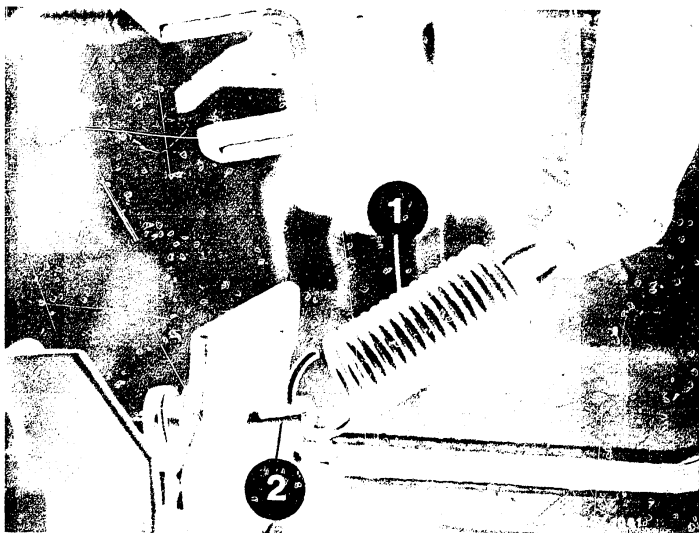
**B23**

Partial repair

Distributor-type pump 0 460 4..







- 1 = Extension spring  
2 = Retaining pin with compression spring

Stick retaining pin with compression springs through bore of tensioning lever and hook in extension spring (see picture, arrow).

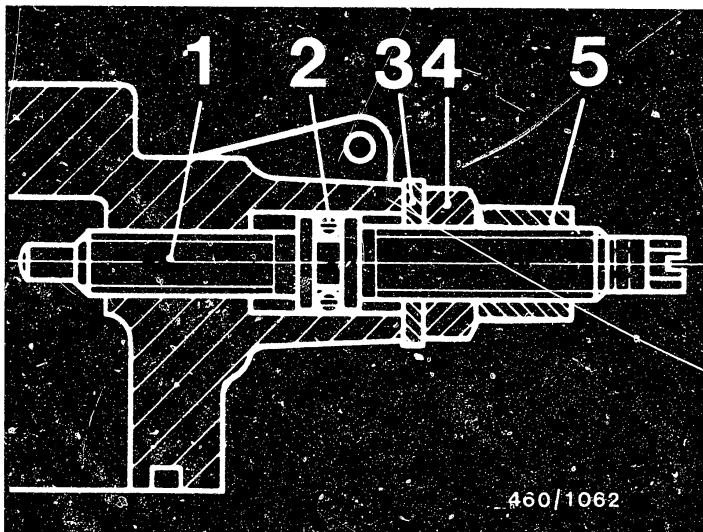
Note:

Retaining pin with compression spring are to be considered as one unit and must only be exchanged together (parts set).

**B24**

Partial repair  
Distributor-type pump 0 450 4..





1 = Threaded pin  
 2 = O-ring  
 3 = Plain washer

4 = Hexagon nut  
 5 = Retaining sleeve

Mount housing cover on pump housing with new threaded pin, O-ring, plain washer, hexagon nut and retaining sleeve.

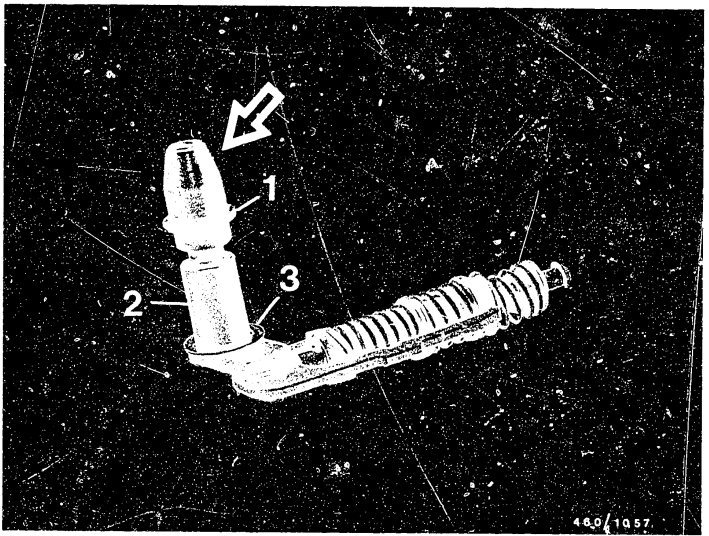
Secure housing cover with fillister-head screws.

**C1**

Partial repair

Distributor-type pump 0 460 4..





1 = O-ring                      3 = Shim  
2 = Control lever shaft

7.2.10 Assembling and mounting the housing cover  
(Part-load governor)

Slip shim onto control lever shaft of part-load governor.

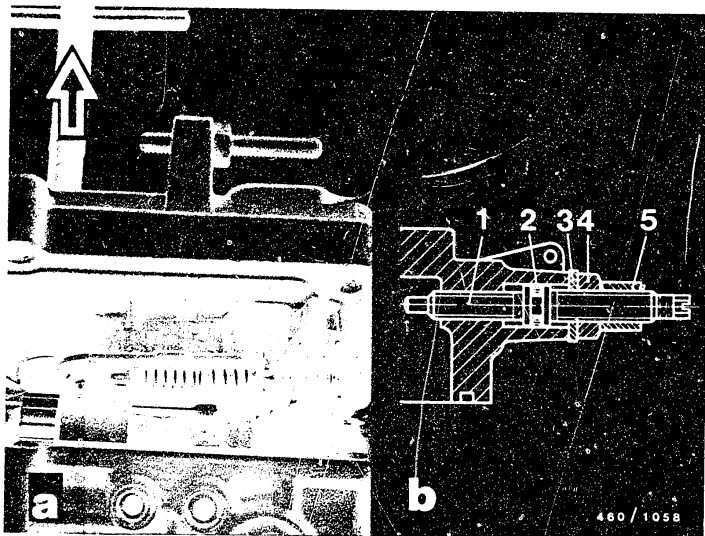
Mount O-ring with assembly sleeve KDEP 2937 (see picture, arrow).

**C2**

Partial repair

Distributor-type pump 0 460 4..





1 = Threaded pin  
 2 = O-ring  
 3 = Plain washer

4 = Hexagon nut  
 5 = Retaining sleeve

Mount housing cover on pump housing with threaded pin, O-ring, plain washer, hexagon nut and retaining sleeve.

Pull control lever shaft through housing cover by means of assembly wrench KDEP 1096 (see picture a, arrow).

Insert part-load governor in fulcrum lever with the machined faces.

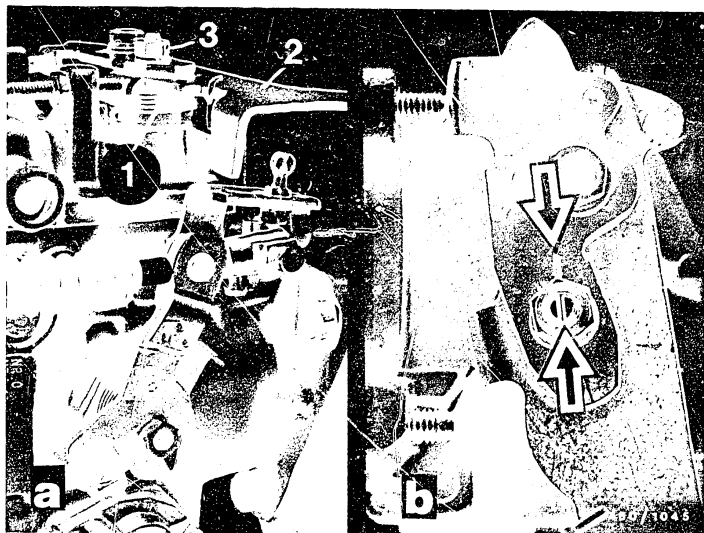
Mount housing cover on pump housing with fillister-head screws.

**C3**

Partial repair

Distributor-type pump 0 460 4..





- 1 = Cylindrical helical coiled spring  
 2 = Control lever  
 3 = Hexagon nut with coiled spring and spring lock washer

Mount cylindrical helical coiled spring, both control levers and hexagon nut with spring lock washer.

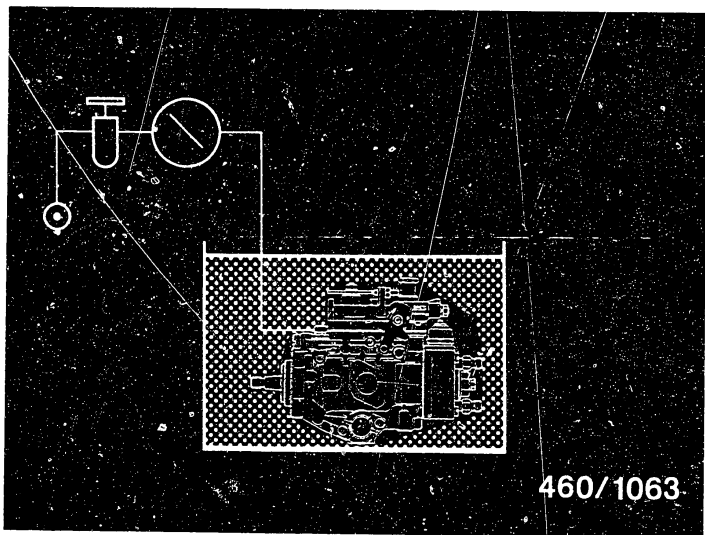
Position control lever on control lever shaft so that marks on control lever and control lever shaft align (see picture b, arrows).

**C4**

Partial repair

Distributor-type pump 0 460 4..





460/1063

#### 7.2.11 Checking the housing cover for leaks

Loctite 582 takes approx. 45 min. at room temperature to reach full operational readiness.

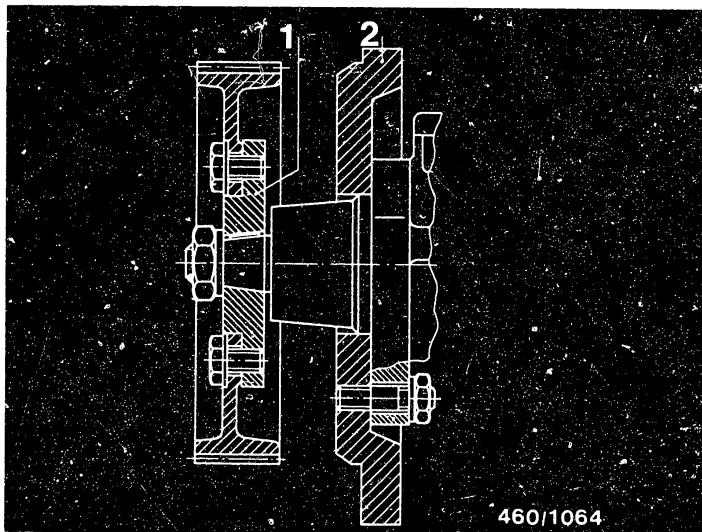
Seal overflow on distributor-type injection pump with screw plug. Make compressed-air connection to suction side of distributor-type injection pump. Place pump in calibrating-oil tank and apply 8 bar test pressure. During the testing time (pressure-holding time) of 20 seconds no air bubbles must escape between bearing bushing and housing cover.

**C5**

Partial repair

Distributor-type pump 0 460 4..





- 1 = Coupling half  
2 = Intermediate flange

#### 8. Dismantling the distributor-type injection pump

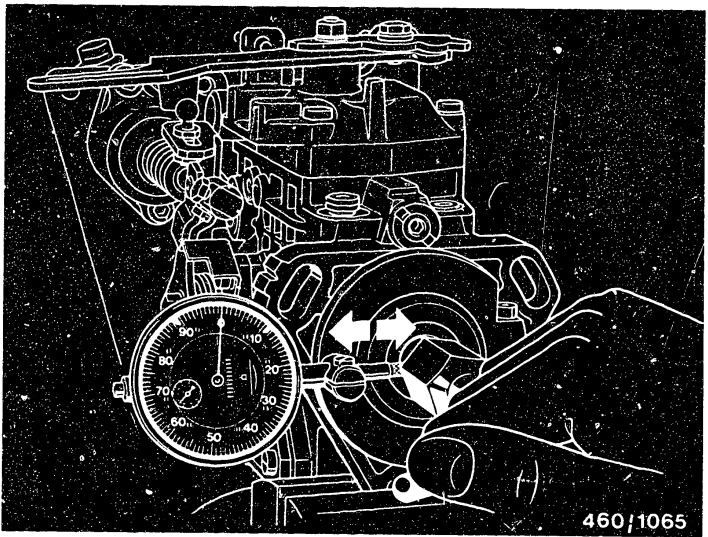
##### Note:

Before dismantling distributor-type injection pumps VE.. R11, R14 and R15, installed in Ford York Transit, remove the coupling half (using commercially available puller) and take off intermediate flange.

**C6**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





### 8.1 Checking the tilting play

Each time before dismantling and repairing distributor-type injection pumps with toothed-belt drive, the tilting play of the drive shaft should be measured in order to avoid unnecessary operations.

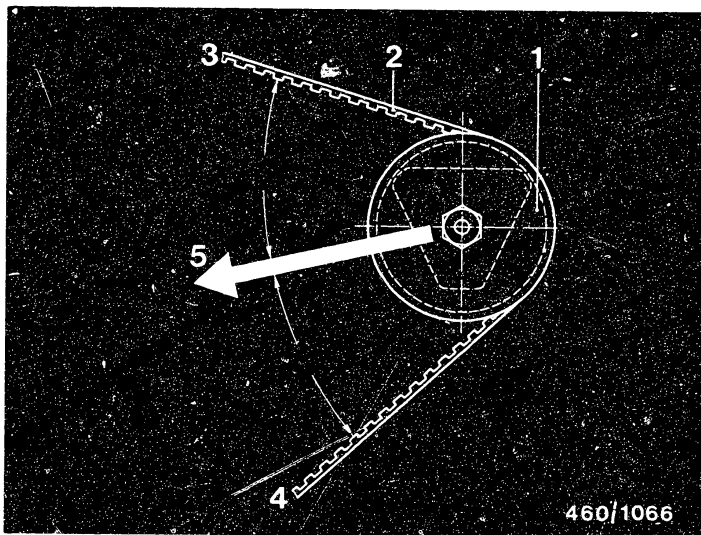
Mount dial-indicator holder KDEP 1128 or KDEP 1146 with dial indicator 1 687 233 011 on centering collar of pump flange. Screw measuring tool KDEP 2890 onto drive shaft. Preload dial indicator by approx. 2 mm. Move the drive shaft of the pump to and fro by hand at the threaded pin in the direction of the resultant pulling force of the toothed belt (see picture, arrow).

**C7**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..







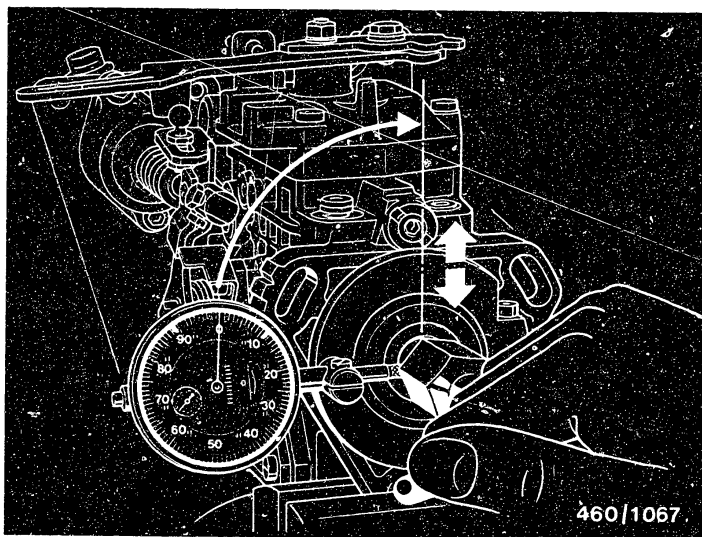
- 1 = Distributor-type injection pump drive gear
- 2 = Toothed belt
- 3 = Toothed-belt side 1
- 4 = Toothed-belt side 2
- 5 = Direction of resulting toothed-belt force

The direction of the resultant pulling force results from the position of the two toothed-belt sides in relation to the pump drive gear on the engine. This position is to be established before removing the pump.

**C8**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





After the first measurement, slightly loosen the clamping screw on the dial-indicator holder. Turn dial-indicator holder with dial indicator through  $90^\circ$  with respect to the first measuring plane. Re-tighten clamping screw. In this measuring plane, perform the second measurement of the tilting play. In both measuring planes the tilting play must not exceed max. 0.25 mm.

**C9**

Dismantling the fuel-injection pump  
Distribution-type pump 0 460 4..



In the case of directly driven distributor-type injection pumps (not via toothed belt), the two measuring planes are placed horizontal and vertical to the pump housing. Once again, the tolerance for the tilting play is max. 0.25 mm.

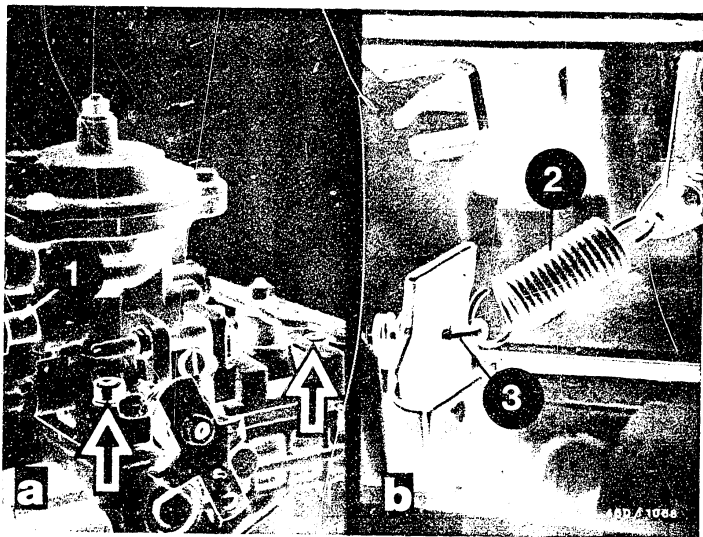
If the stated tolerance for the tilting play is exceeded, it is necessary to use a new housing (if necessary, also new drive shaft).

**C10**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = Overflow restriction      3 = Retaining pin  
 2 = Extension spring

### 8.2 Removing the manifold-pressure compensator (LDA)

Remove overflow restriction and drain distributor-type injection pump.

Mount distributor-type injection pump with flange and support clamp KDEP 2963 on clamping support KDEP 2919.

Loosen manifold-pressure compensator housing from pump housing. Remove fastening screws (arrows).

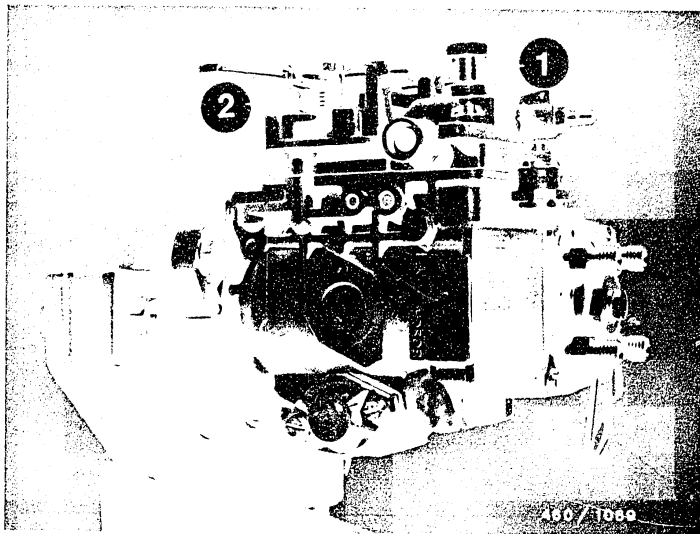
Unhook extension spring from retaining pin. Lay aside manifold-pressure compensator housing.

**C11**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





- 1 = Overflow restriction  
2 = Cylindrical helical coiled spring

### 8.3 Dismantling distributor-type injection pumps with variable-speed governor

Remove overflow restriction.

Drain distributor-type injection pump.

Mount distributor-type injection pump with flange and support clamp KDEP 2963 on clamping support KDEP 2919.

Unhook cylindrical helical coiled spring.

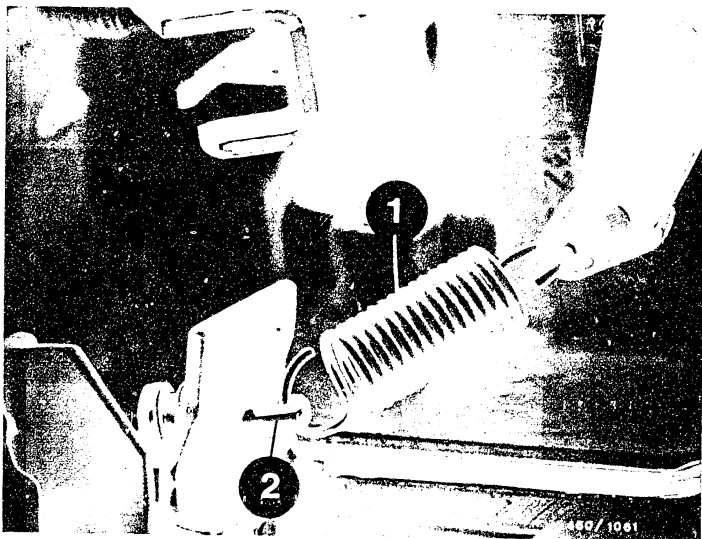
Mark control lever and control lever shaft in relation to each other. Remove fastening screws from housing cover.

**C12**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = Extension spring

2 = Retaining pin with compression spring

Lift off housing cover and unhook extension spring from retaining pin (see picture).

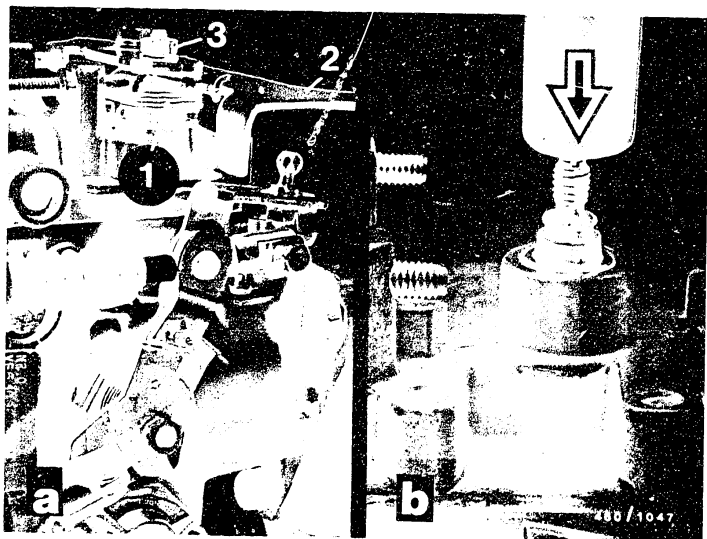
Lay aside retaining pin with compression springs.

Unhook extension spring from control lever shaft.

**C13**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Cylindrical helical  
coiled spring  
2 = Control lever

3 = Hexagon nut with spring  
lock washer

Remove hexagon nut with spring lock washer.

Pull off control lever.

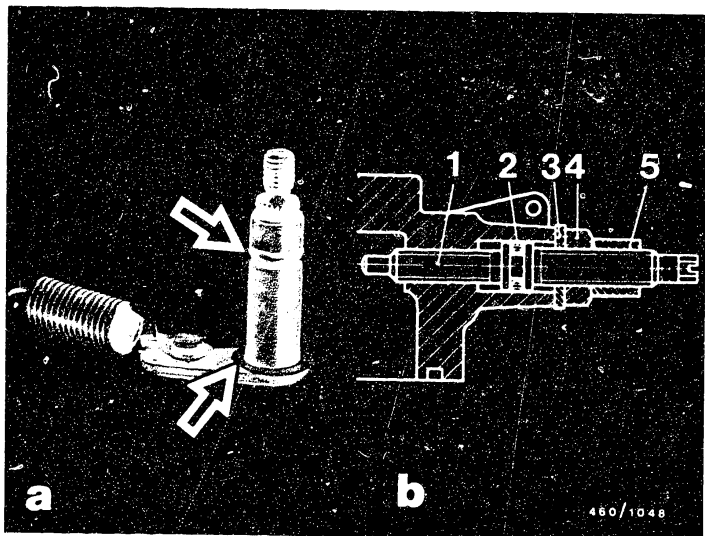
Press control lever shaft through toward inside of cover (e.g. with handle of screwdriver, see picture b).

**C14**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





- 1 = Threaded pin
- 2 = O-ring
- 3 = Plain washer
- 4 = Hexagon nut
- 5 = Retaining sleeve

Remove O-ring and shim from control lever shaft (see picture a, arrows).

Remove seal ring from housing cover.

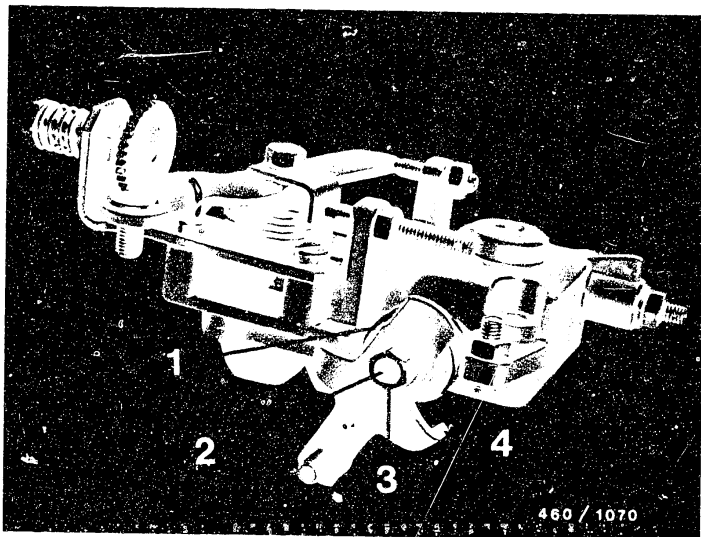
Remove threaded pin with hexagon nut, plain washer, O-ring and retaining sleeve.

**C15**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..







- 1 = Cylindrical helical coiled spring
- 2 = Lever shaft
- 3 = Hexagon nut
- 4 = Stop lever

If a mechanical shutoff device is fitted, remove as follows:

Unhook cylindrical helical coiled spring.

Mark position of outer stop lever/starting fuel delivery limitation in relation to lever shaft.

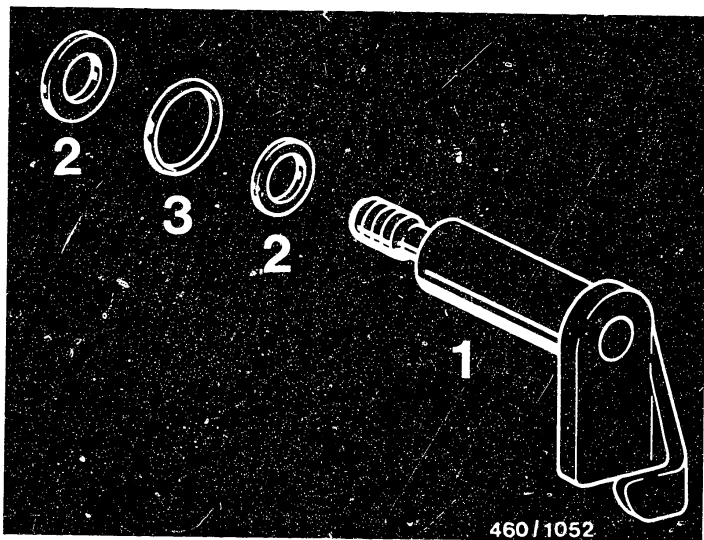
Remove hexagon nut and spring lock washer.

Pull off outer stop lever from lever shaft.

**C16**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





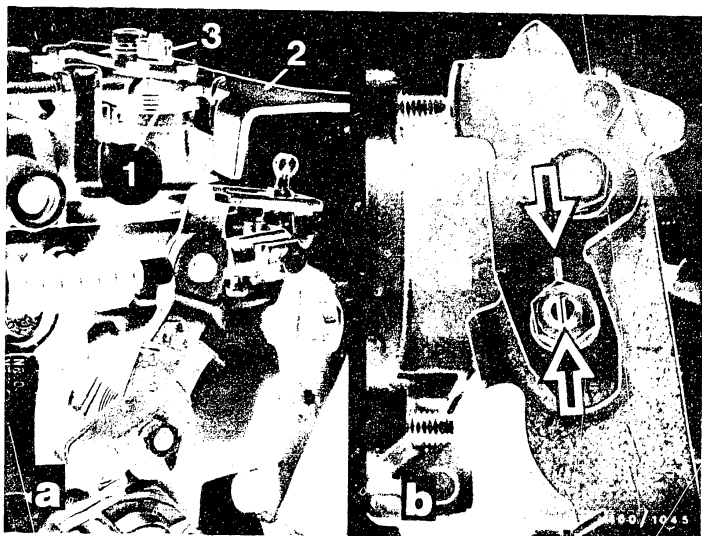
- 1 = Lever shaft
- 2 = Shims
- 3 = O-ring

Pull lever shaft out of housing cover.  
Remove shims and O-ring.

**C17**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Cylindrical helical coiled spring
- 2 = Control lever
- 3 = Hexagon nut with spring lock washer

#### 8.4 Dismantling distributor-type injection pumps with part-load governor

Remove overflow restriction.  
 Drain distributor-type injection pump.

Mount distributor-type injection pump with flange and support clamp KDEP 2963 on clamping support KDEP 2919.

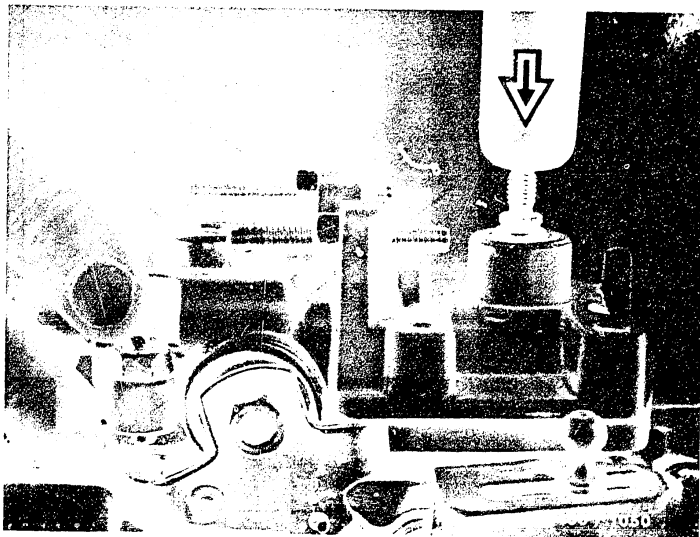
Unhook cylindrical helical coiled spring. Mark control lever and control lever shaft in relation to each other (see picture b - arrows).

Remove hexagon nut and spring lock washer.  
 Pull off control lever from control lever shaft.  
 Remove fastening screws from housing cover.

**C 18**

Dismantling the fuel-injection pump  
 Distributor-type pump 0 460 4..



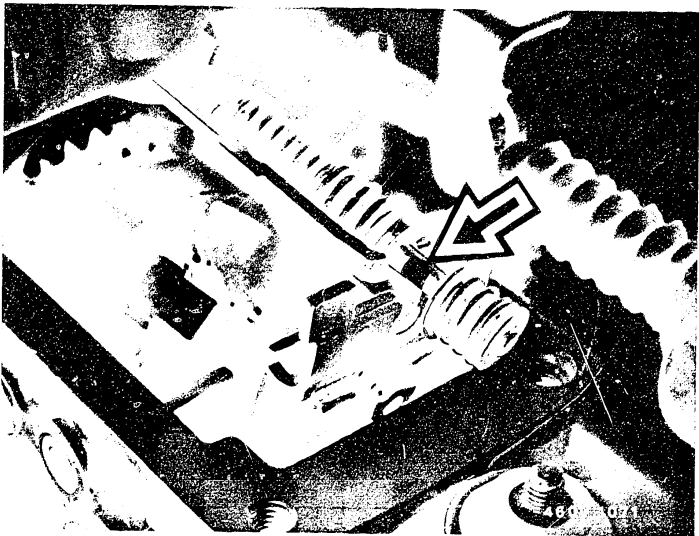


Push control lever shaft with part-load governor through toward inside of cover (e.g. with handle of screwdriver, see picture). Remove O-ring and shim from control lever shaft.

**C19**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





#### 8.4.1 Removing part-load governors with unhooking faces

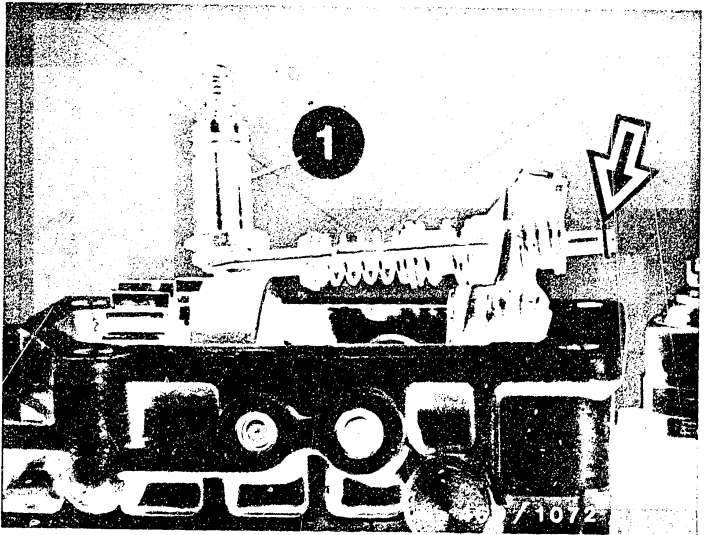
In the case of part-load governors with machined faces on the spring guide pin (see picture, arrow), slide part-load governor in direction of fulcrum lever and unhook from fulcrum lever at the machined faces.

#### Note:

The part-load governor is available only as one complete service part.

Caution! Do not overextend the main governor spring since there is no limit stop. Otherwise there is a change in the spring value.





#### 8.4.2 Removing part-load governors without unhooking faces

Remove retainer from guide pin of part-load governor (see picture, arrow).

Remove retaining pin and intermediate spring.

Remove part-load governor complete with control lever shaft, main governor spring and part-load spring from fulcrum lever assembly.

#### Note:

The part-load governor is available only as one complete service part.

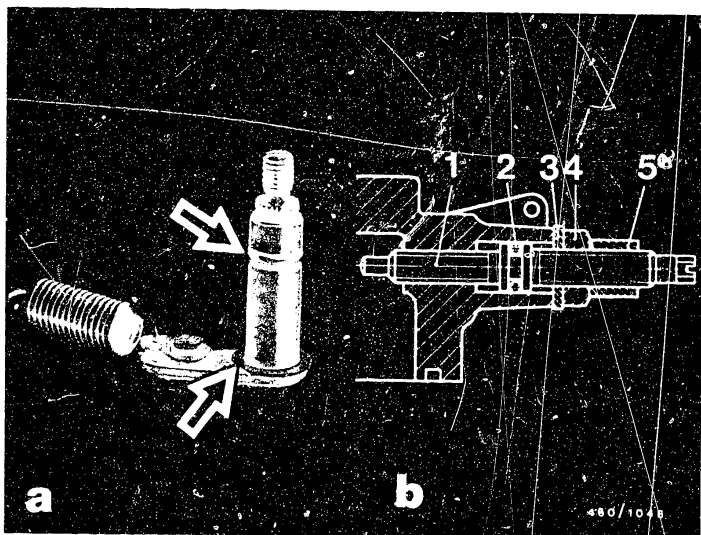
Caution! Do not overextend the main governor spring since there is no limit stop. Otherwise there is a change in the spring value.

**G21**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..



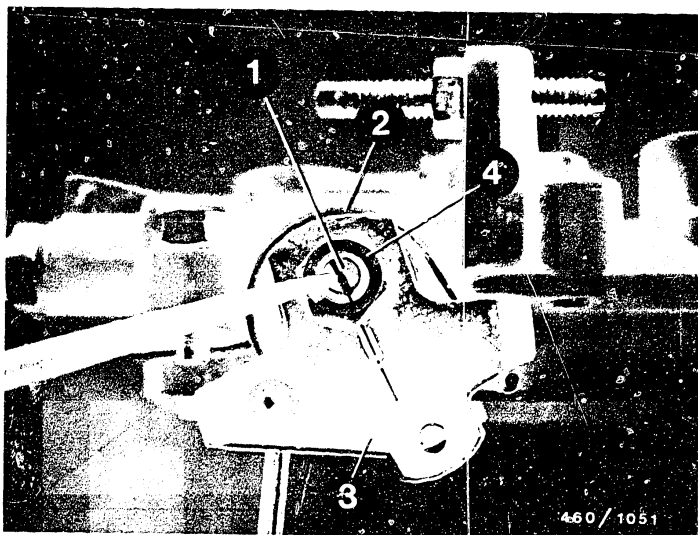


- 1 = Threaded pin
- 2 = O-ring
- 3 = Plain washer
- 4 = Hexagon nut
- 5 = Retaining sleeve

Remove O-ring and shim from control lever shaft (see arrows, picture a).

Remove housing cover. Take seal ring out of housing cover (not shown). Remove threaded pin with hexagon nut, plain washer, O-ring and retaining sleeve (see picture b).





1 = Lever shaft  
2 = Cylindrical helical  
coiled spring

3 = Regulating lever  
4 = Hexagon nut

### 8.5 Removing the temperature-controlled starting fuel delivery limitation (TAS)

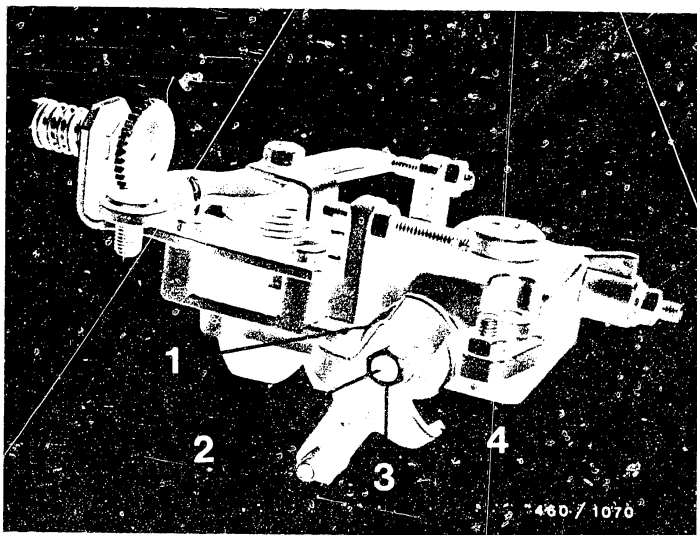
Unhook cylindrical helical coiled spring.  
Mark position of regulating lever/stop lever in the case of mechanical shutoff in relation to the lever shaft (see picture).  
Remove hexagon nut with spring lock washer.  
Pull off regulating lever from lever shaft.

**C23**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..







- 1 = Cylindrical helical coiled spring
- 2 = Lever shaft
- 3 = Hexagon nut
- 4 = Stop lever or starting fuel delivery limitation

### 8.6 Dismantling the mechanical shutoff device

If a mechanical shutoff device is fitted, remove as follows:

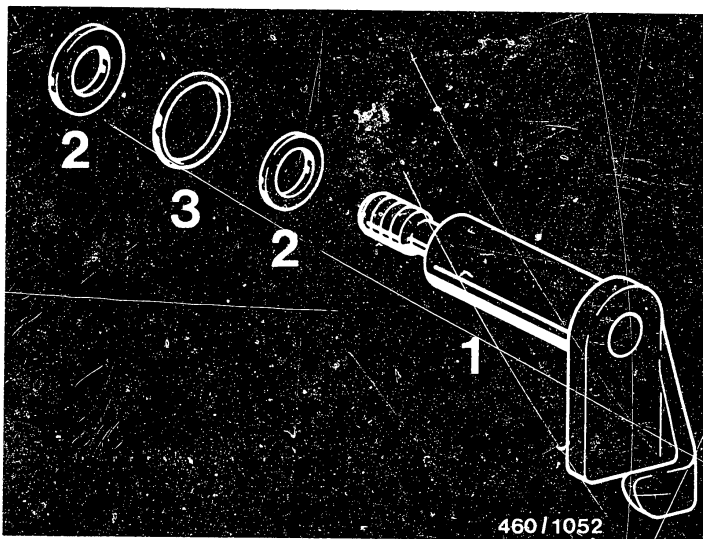
Unhook cylindrical helical coiled spring.

Mark position of outer stop lever/starting fuel delivery limitation in relation to lever shaft.

Remove hexagon nut and spring lock washer.

Pull off outer stop lever from lever shaft.





- 1 = Lever shaft
- 2 = Shims
- 3 = O-ring

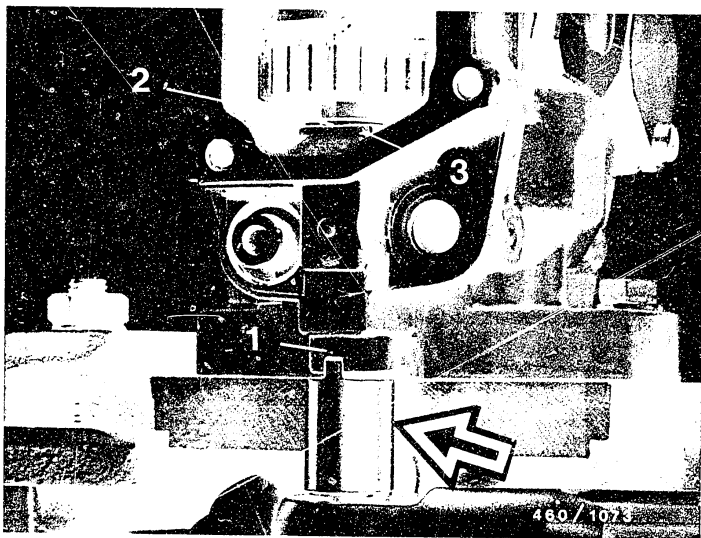
Pull lever shaft out of housing cover.

Remove shims and O-ring.

**D1**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Slotted round nut
- 2 = Supporting plate
- 3 = Shim plate

### 8.7 Removing the governor shaft

In the case of slotted round nuts with an identification groove on the circumference, the governor shaft and slotted round nut have a left-hand thread.

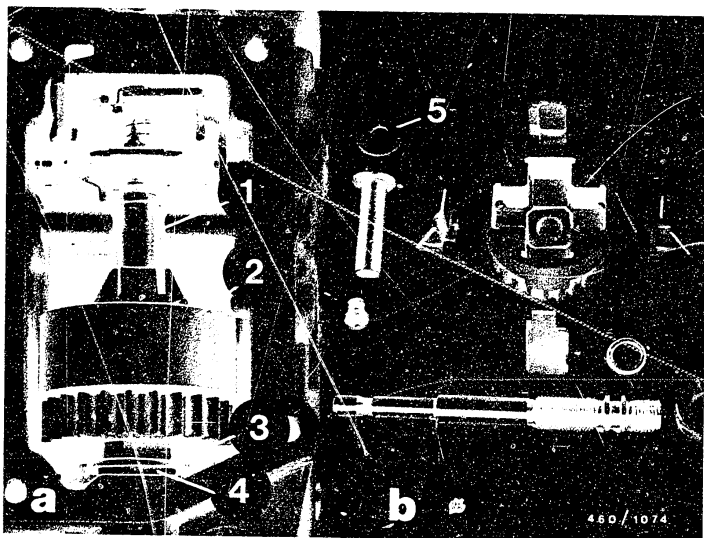
Place the distributor-type injection pump vertical. Using setting tool KDEP 1082 (see picture, arrow) loosen slotted round nut. Pay attention to supporting plate and shim plate.

Note: In the case of all clockwise-rotating injection pumps with pilot 50 mm dia., the thread of the governor shaft and of the pump housing was changed as of FD 151 from left-hand to right-hand thread. The previously used slotted round nut is replaced by a hexagon nut and plain washer.

**D2**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Sliding sleeve
- 2 = Governor assembly
- 3 = Supporting plate
- 4 = Shim plate
- 5 = Shim ring

### 8.8 Removing the governor assembly

Lift out the governor assembly with flyweights and sliding sleeve.

Remove supporting plate and shim plate.

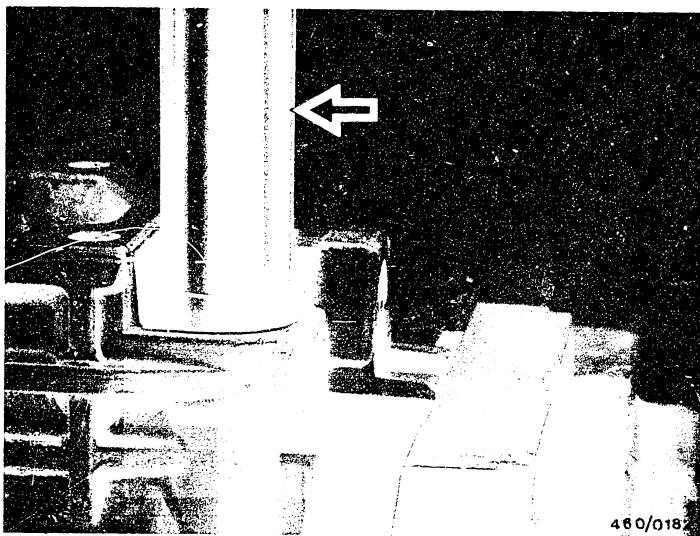
When dismantling the governor assembly, pay particular attention to shim ring and sliding sleeve (do not lose).

**D3**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





### 8.9 Removing the pressure regulator

Unscrew pressure regulator out of distributor-type pump housing using socket wrench KDEP 1086 (arrow) and remove O-rings.

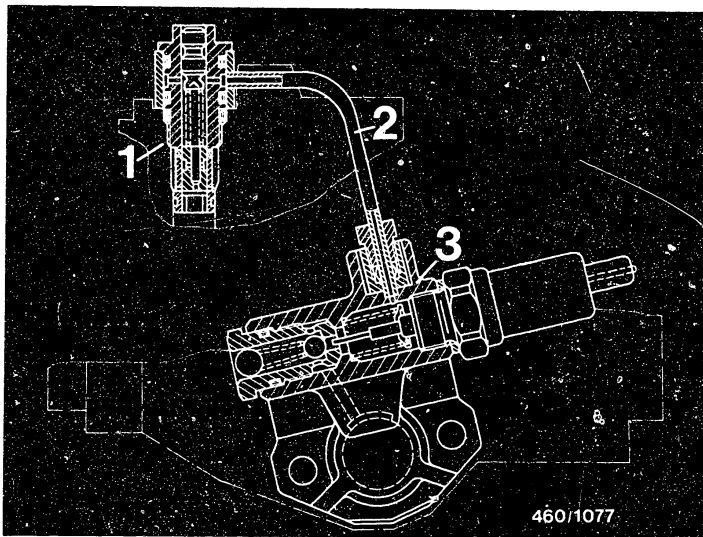
#### Note:

In the case of an hydraulic cold-start accelerator, previously remove ring main to pressure regulator.

**D4**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Pressure regulator
- 2 = Ring main
- 3 = Cold-start accelerator control valve

#### 8.10 Removing the hydraulic cold-start accelerator (KSB)

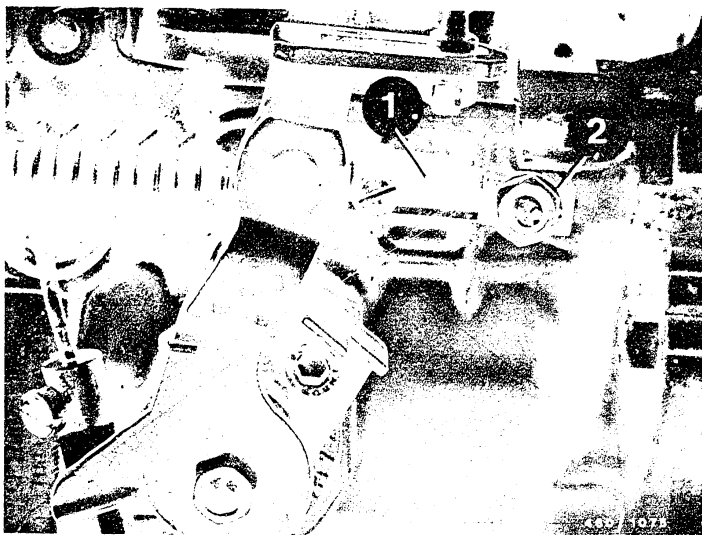
Remove ring main from pressure regulator and cold-start accelerator control valve.

Unscrew cold-start accelerator control valve.

**D5**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Intermediate piece  
2 = Clamping piece

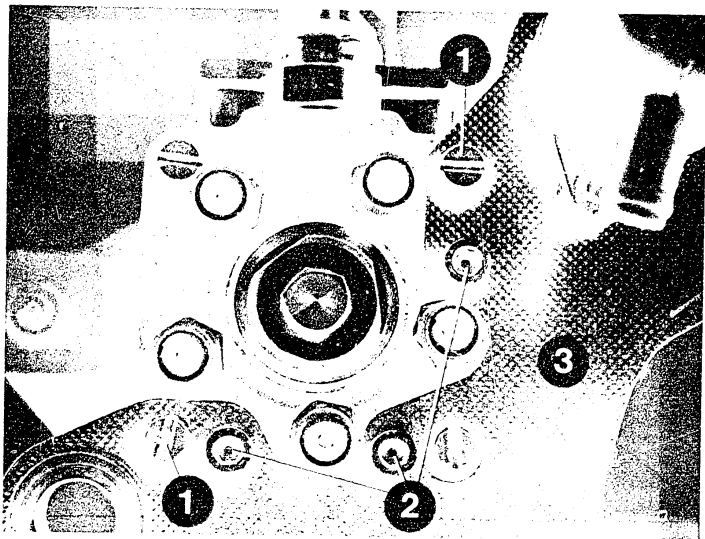
8.11 Loosening the cable on the control lever on  
temperature-controlled cold-start accelerator

If applicable, remove intermediate piece and clamping piece from cable between control device and control lever (see picture).

**D6**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Fillister-head screws
- 2 = Hexagon-socket-head cap screws
- 3 = Supporting plate

### 8.12 Removing the supporting plate

Remove three hexagon-socket-head cap screws.

Unscrew two fillister-head screws and remove supporting plate.

Note: As of FD 145 the fillister-head screws have been replaced by hexagon-socket Torx screw T 30.

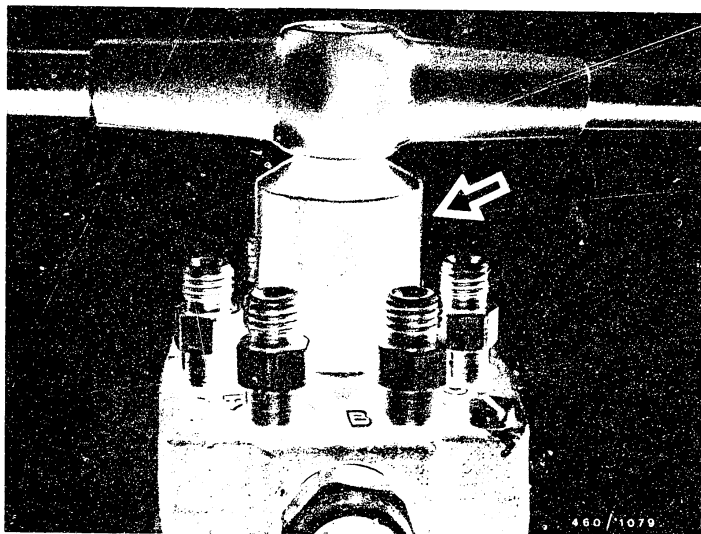
For the removal and installation of the Torx screws it is necessary to have a commercially available screw-driver bit for torque wrench.

**D7**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..







### 8.13 Removing the central screw plug and delivery-valve holders

Unscrew screw plug with wrench KDEP 1080 (see picture, arrow). Remove seal ring.

Remove delivery-valve holders, compression springs, shims and delivery valves.

Remove seal rings with extractor hook KDEP 2938.

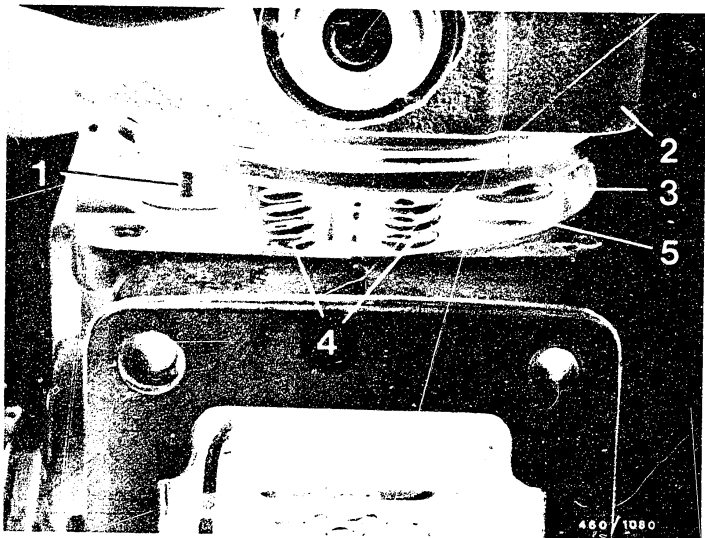
Note: The outlets on the hydraulic head are identified by code letters A, B, C etc (see picture).

Lay aside delivery-valve holders, compression springs etc in accordance with these code letters so that they are re-installed in the same position.

**D8**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Guide pins
- 2 = Hydraulic head
- 3 = Spring seat
- 4 = Compression springs
- 5 = Shim ring

#### 8.14 Removing the hydraulic head

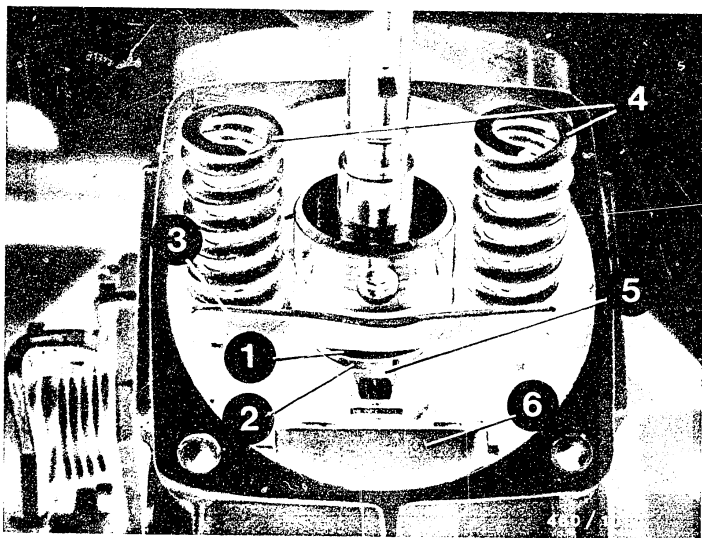
Unscrew fastening screws uniformly. Carefully lift off hydraulic head, paying attention to guide pins, shim rings and spring seats.

If necessary, hold compression springs.

**D9**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Shim (large)
- 2 = Slotted washer
- 3 = Spring seat
- 4 = Compression springs
- 5 = Shim (small)
- 6 = Fulcrum lever assembly

Lift out distributor-pump plunger with control collar, shim (large), slotted washer, spring seat and compression spring.

Pay attention to shim (small) under plunger base.

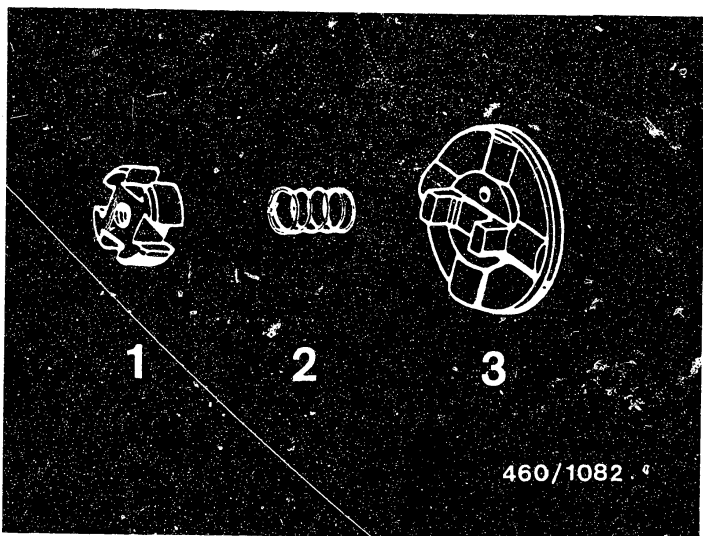
Remove seal ring from hydraulic head.

Remove solenoid-operated valve (if applicable) with O-ring. Remove fulcrum lever assembly, consisting of starting lever, tensioning lever, and correction lever.

**D 10**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Slotted washer
- 2 = Compression spring
- 3 = Cam plate

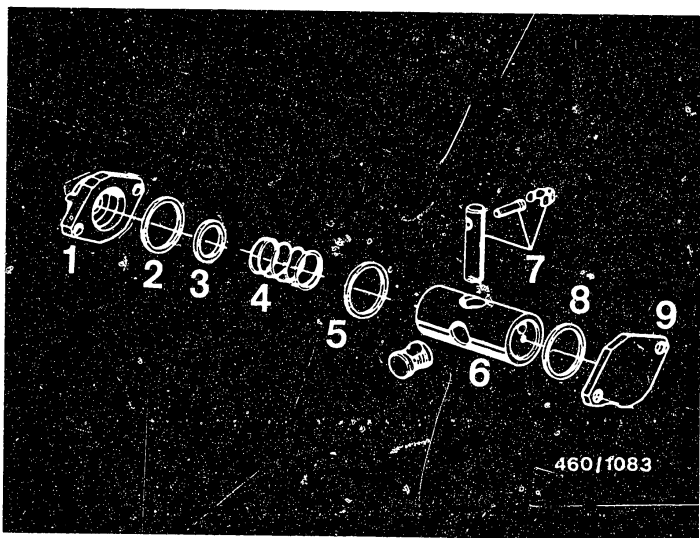
Remove cam plate.

Remove slotted washer and, if necessary, compression spring.

**D11**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





460/1083

- |  |                           |
|--|---------------------------|
| 1 = Closing cover                              | 7 = Sliding bolt with re- |
| 2 = Seal ring                                  | taining pin and retaining |
| 3 = Shim                                       | bracket                   |
| 4 = Compression spring                         | 8 = Seal ring             |
| 5 = Shim                                       | 9 = Cover plate           |
| 6 = Timing-device piston<br>with sliding piece |                           |

Dismantle timing device; to do this, unscrew closing cover with shims.

Take off seal ring. Take compression spring and shim out of timing-device piston.

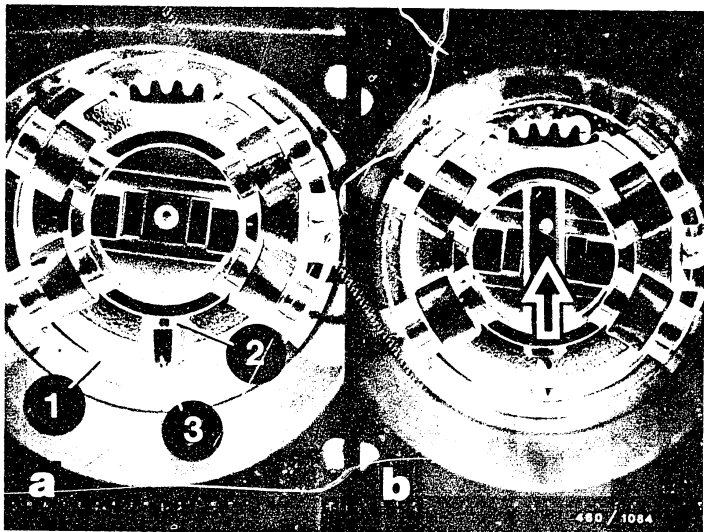
Unscrew cover plate and remove seal ring.

**D12**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = Cam roller ring  
2 = Sliding bolt

3 = Retaining bracket

Removing the cam roller ring and the timing-device piston

Pull off retaining bracket.

Pull out retaining pin with pointed-nose pliers.

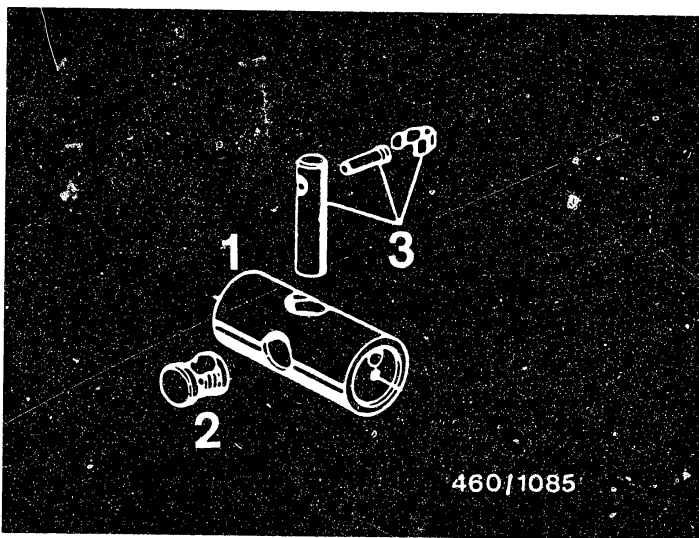
Place claw of drive shaft transversely (see picture a).

Slide sliding bolt in direction of center of cam roller ring.

**D13**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Timing-device piston
- 2 = Sliding piece
- 3 = Sliding bolt with retaining pin and retaining bracket

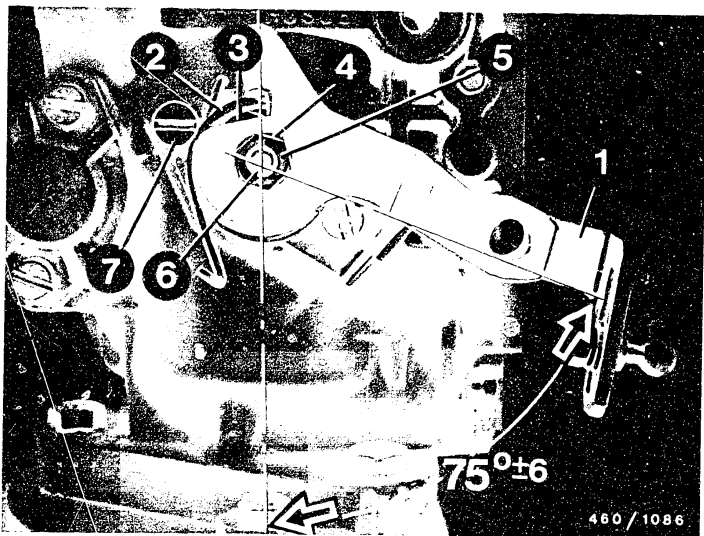
Slide out timing-device piston including sliding piece (pay attention to the sliding piece).  
If applicable, remove side closing cover for pointer adjustment. Take off seal ring and unscrew setting plate.

**D14**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





- 1 = Control lever
- 2 = Cylindrical helical coiled spring
- 3 = Shim
- 4 = Spring lock washer
- 5 = Hexagon nut
- 6 = Control lever shaft
- 7 = Fillister-head screw

### 8.15 Removing the temperature-controlled cold-start accelerator (KSB) - acting on cam roller ring

Unhook cylindrical helical coiled spring on control lever.

Remove hexagon nut with spring lock washer.  
 Pull off control lever from control lever shaft.  
 Remove fillister-head screws and spring lock washers.  
 Remove complete fitting cover with control lever shaft from distributor-type injection pump.  
 Take O-ring out of pump housing.

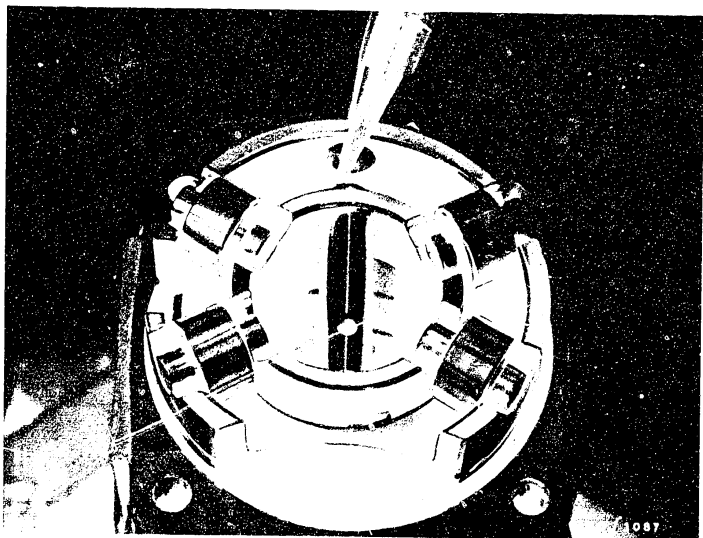
**D15**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..







### 8.16 Removing the cam roller ring

Lift out cam roller ring with rollers without tilting.

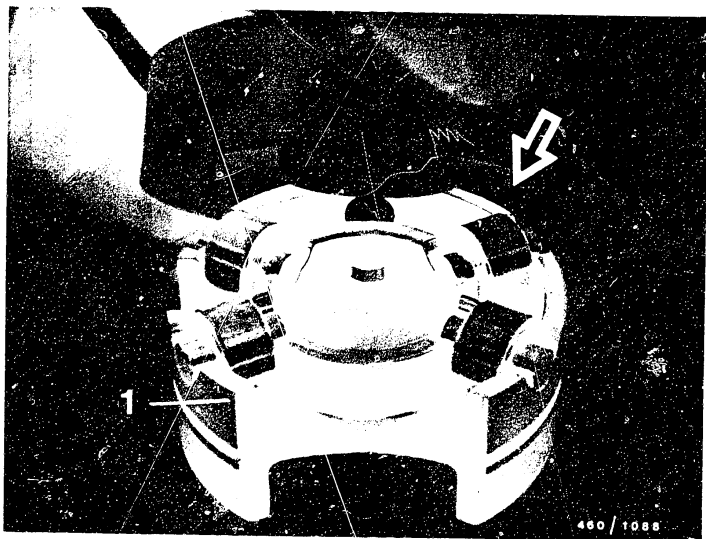
Note:

Do not mix up the rollers.

**D16**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Cam roller rings

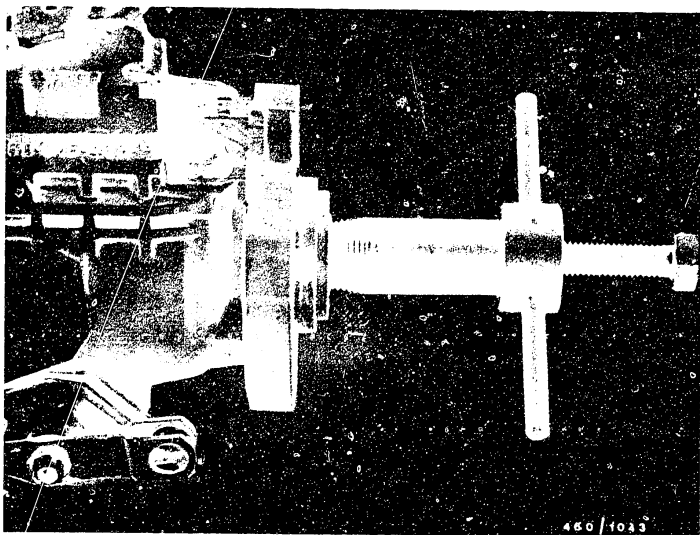
Slide sliding bolt out of cam roller ring.

To protect the rollers against dropping out, place protective capsule KDEP 1100 (see picture, arrow) over cam roller ring.

**D17**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





### 8.17 Removing the drive shaft

Remove radial-lip-type oil seal with puller KDEP 1113 or KDEP 1114 (depending on shaft diameter). Slide drive shaft out in an upward direction. Pay attention to Woodruff key.

**D18**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





Pull off toothed wheel (see picture, arrow) and rubber buffer from drive shaft.

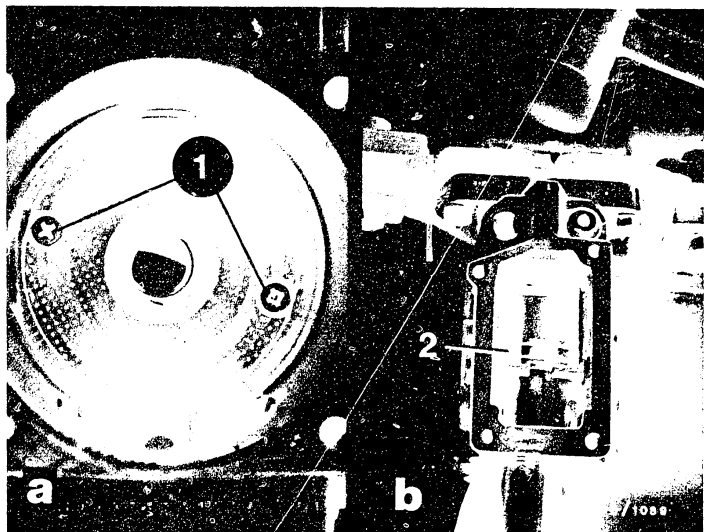
Remove slotted washer from housing.

**D 19**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..





- 1 = Flat-head screws  
 2 = Support ring

### 8.18 Removing the vane pump

Unscrew flat-head screws (see picture a).  
 Introduce assembly tool KDEP 1097 into distributor-type injection pump housing.  
 Tilt distributor-type injection pump housing downward, thereby pressing KDEP 1097 with holding mandrel into distributor-type injection pump housing.

While continuously tapping with a rubber hammer on the pump housing, bring out downward the support ring and supply pump, consisting of slotted washer with pump vane and support ring (eccentric ring).





Remove supporting plate with slotted washer from assembly tool KDEP 1097.

Slip assembly shell KDEP 1101 (see picture, arrow) over slotted washer and pump vane.

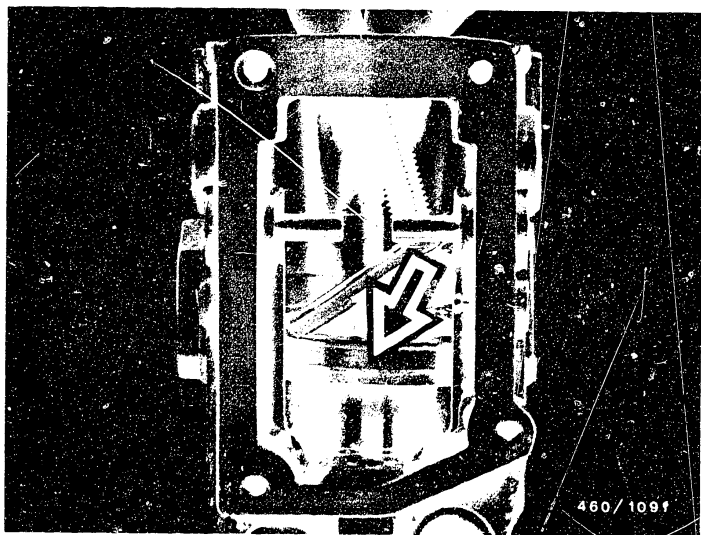
If support ring is tilted, perform the following operations:

**D21**

Dismantling the fuel-injection pump

Distributor-type pump B 460 4..



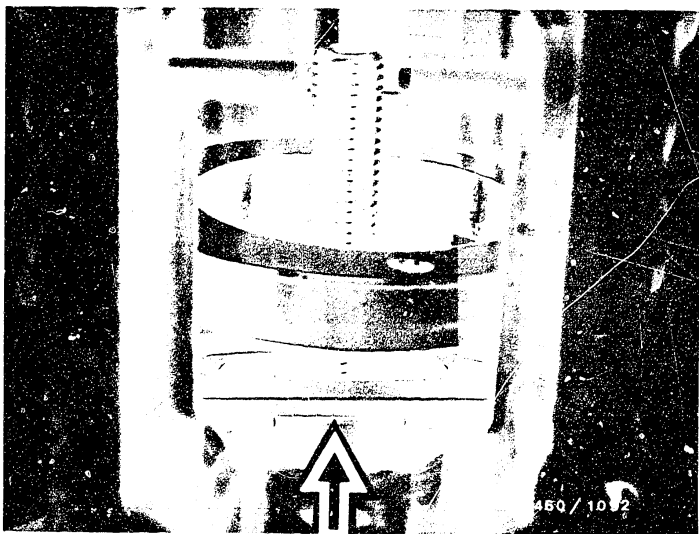


Slide puller of assembly tool KDEP 1097 behind support ring (eccentric ring) (see picture, arrow).

**D22**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





Centralize the puller.

The machined faces of the threaded pin are in the groove of the puller (see picture, arrow).

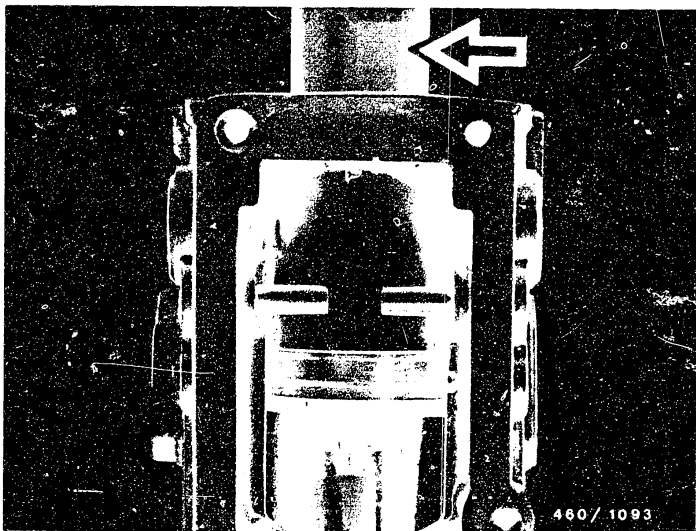
**D23**

Dismantling the fuel-injection pump

Distributor-type pump 0 460 4..







Remove support mandrel of vane pump from assembly tool KDEP 1097.

Introduce assembly tool (see picture, arrow) into pump housing and screw onto threaded pin.

The support ring (eccentric ring) is thereby pulled to the assembly tool.

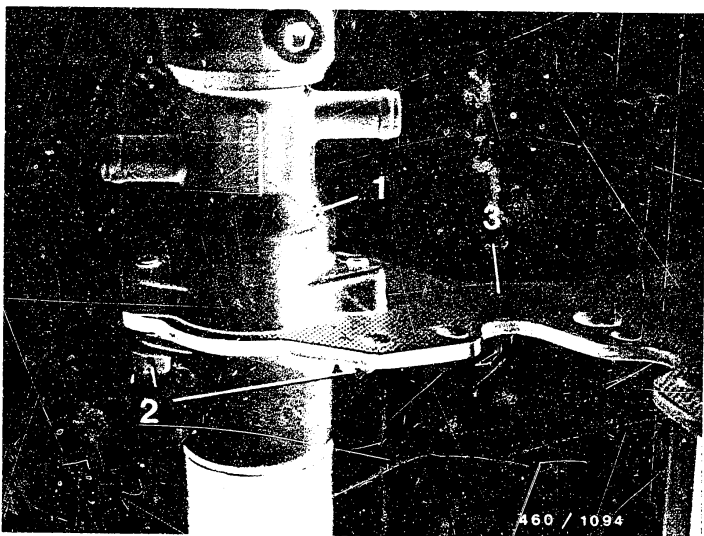
Pull assembly tool with support ring out of the pump housing.

Check inside of pump housing for damage and wear.

**D24**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Control device
- 2 = Hexagon-socket-head cap screws
- 3 = Supporting plate

### 8.19 Dismantling the control device of the temperature-controlled idle-speed increase (TLA)

Insert complete control device in assembly device KDEP 1109.

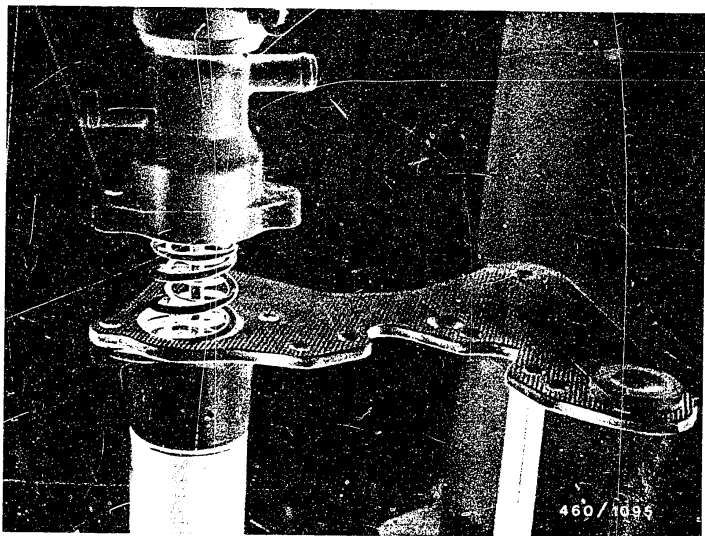
Lightly compress control device under arbor press.

Unscrew hexagon-socket-head cap screws.

**E1**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





Relax compression springs of control device by turning back the arbor press.

Remove both compression springs.

Remove spring seat with cable.

**E2**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..





Clamp control device in vise with protective jaws.

Unscrew threaded ring (see picture, arrow) by means of pin wrench KDEP 1110.

Remove thermostat and O-ring from housing.

Do not pull pin out of thermostat.

**E3**

Dismantling the fuel-injection pump  
Distributor-type pump 0 460 4..



## 9. Cleaning the parts

Wash out the parts in low-inflammability commercially available cleaning agent, e.g. Chlorothene NU.  
Then blow off with compressed air.

### Observe the following safety regulations

Decree on working with inflammable liquids (Vbf)  
issued by the Federal Ministry of Labor (BmA).

Safety rules for handling chlorinated hydrocarbons  
for the workshop ZH 1 / 222  
for the employee ZH 1 / 119  
issued by the Central Association for German Employers'  
Liability Insurance Associations (Central Association  
for Accident Prevention and Industrial Medicine)  
Langwartweg 103, 5300 Bonn 5.

In countries outside the Federal Republic of Germany,  
observe the corresponding local regulations.

**E4**

Cleaning the parts - safety regulations

Distributor-type pump 0 460 4..



## 10. Checking the individual parts - examination for wear

Worn and damaged parts are to be renewed.

The helixes of the distributor-pump plunger must be sharp-edged; the bearing surfaces must not exhibit any pronounced scoring.

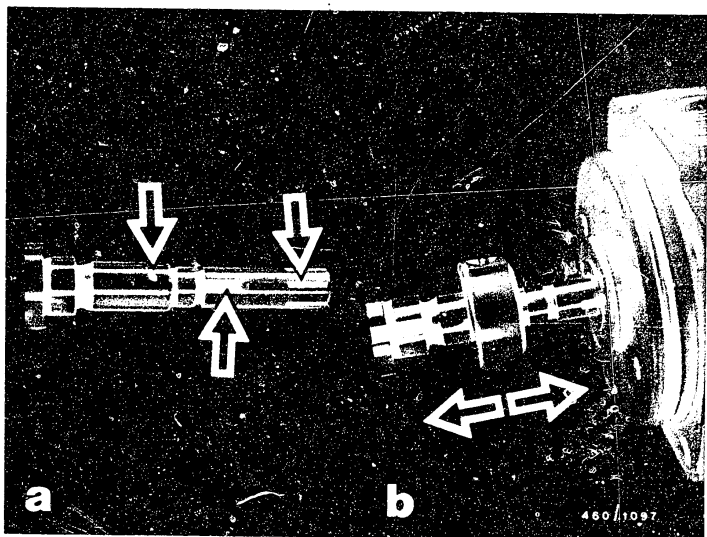
Distributor-pump plunger and control collar, cam roller ring with rollers and spring seat as well as slotted washer with pump vane and support ring are to be regarded as a unit and must always be replaced together (service-part assemblies).

Whenever repairing, always use new seal rings and O-rings.

**E5**

Checking the individual parts  
Distributor-type pump 0 460 4..





On the distributor-pump plunger, particularly check the helixes for sharp edges (see arrows, picture a). Also check the freedom of movement of the distributor-pump plunger in hydraulic head and control collar (see picture b).

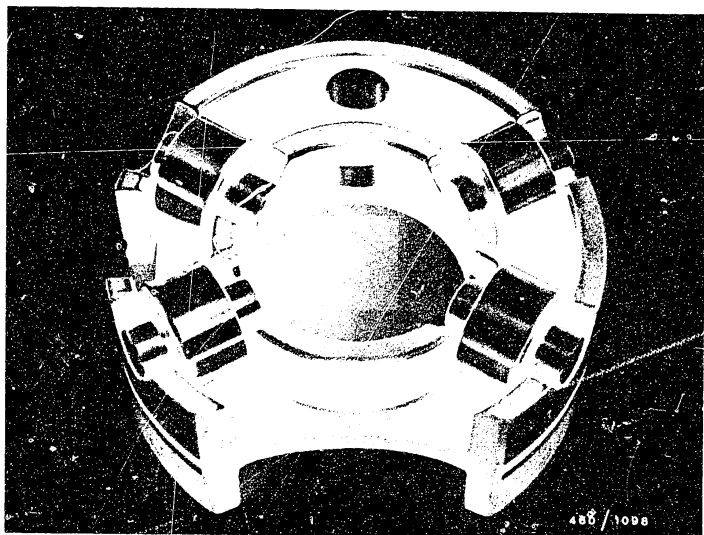
If one of these parts exhibits pronounced wear, the complete hydraulic head with distributor-pump plunger and control collar must be replaced. These parts are dimensionally mated and cannot be exchanged individually.

A final statement on the condition of wear of the distributor-pump plunger with hydraulic head and control collar is only possible on the test bench.

**E6**

Checking the individual parts  
Distributor-type pump 0 460 4..





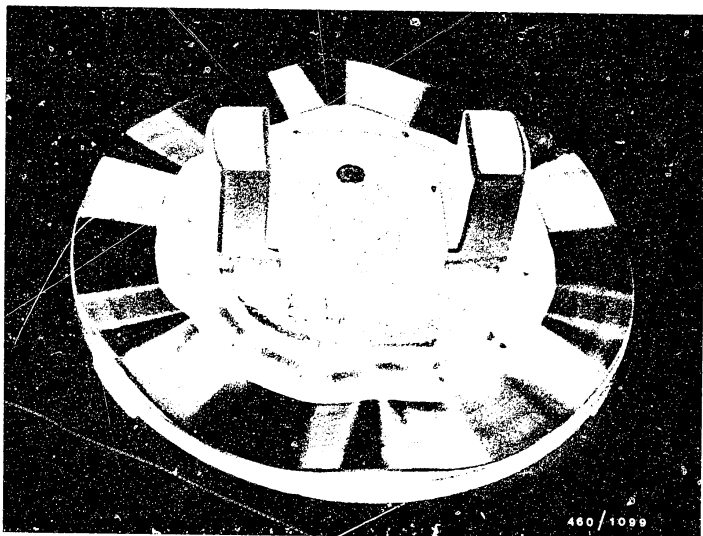
Clean (wash out) cam roller ring with protective capsule KDEP 1100 using cold cleaner. Check the condition of the rollers and check the freedom of movement. (Do not take rollers out of cam roller ring).

**E7**

Checking the individual parts  
Distributor-type pump 0 460 4..







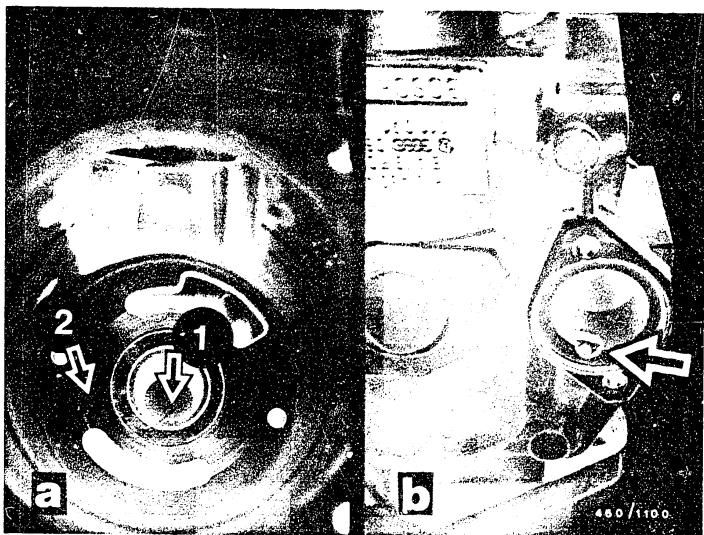
Check the camways of the cam plate for wear. If the cam plate exhibits wear marks or is worn blue, it must be replaced.

In this case, it may also be necessary to replace the complete cam roller ring since it is also highly probable that the rollers are clearly worn.

**E8**

Checking the individual parts  
Distributor-type pump 0 460 4..



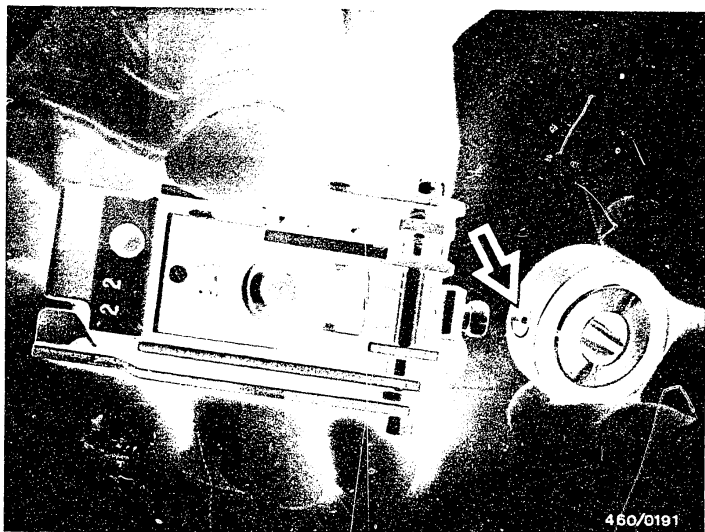


In the pump housing, check the plain bearing (picture a, arrow 1), contact surface of the supply pump on the housing base (picture a, arrow 2) and bore for timing device (picture b, arrow) for scoring.

**E9**

Checking the individual parts  
Distributor-type pump 0 460 4..





460/0191

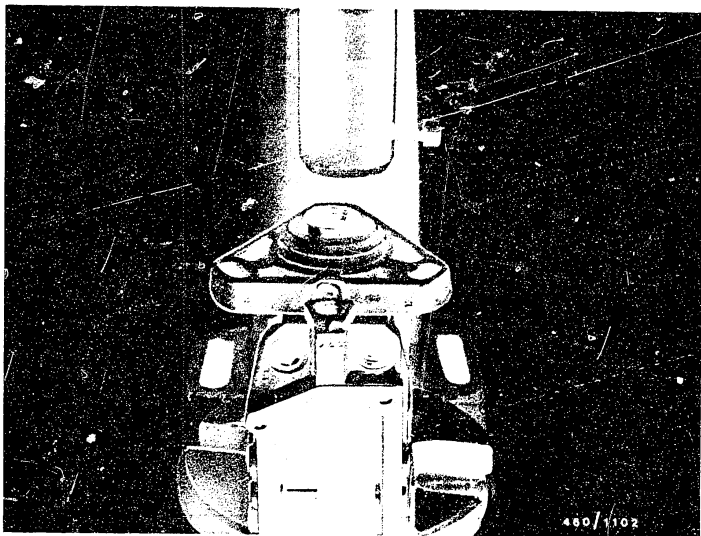
Check the ball stud of the fulcrum lever assembly in the control collar bore (see picture, arrow) for freedom of movement and security.

If necessary, replace fulcrum lever assembly/control collar including distributor-pump plunger and hydraulic head.

**E10**

Checking the individual parts  
Distributor-type pump 0 460 4..





### 11. Assembling the distributor-type fuel-injection pump

Assembly must be performed at a clean workplace.

All moving parts, seal rings and O-rings are to be oiled with calibrating oil prior to assembly.

All screws are to be tightened to the specified tightening torque.

Press radial-lip-type oil seal into housing with arbor press (see picture).

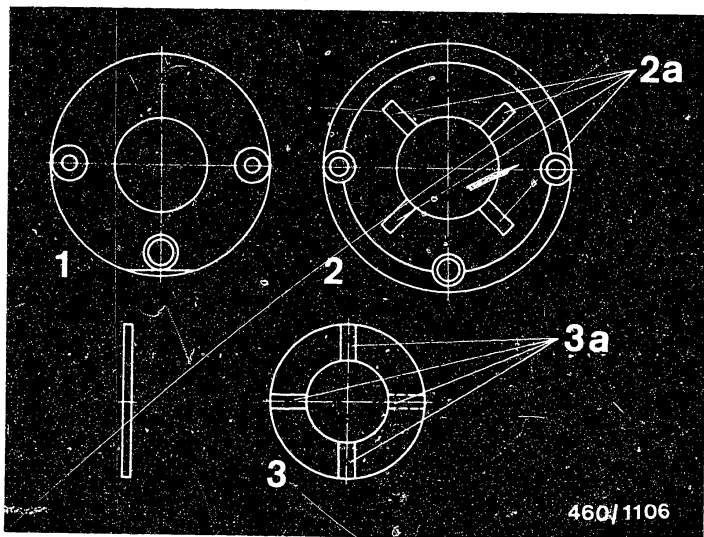
Mount the distributor-type injection-pump housing on clamping support KDEP 2919 using appropriate flange and support clamp KDEP 2963, and swivel downward.

**E11**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





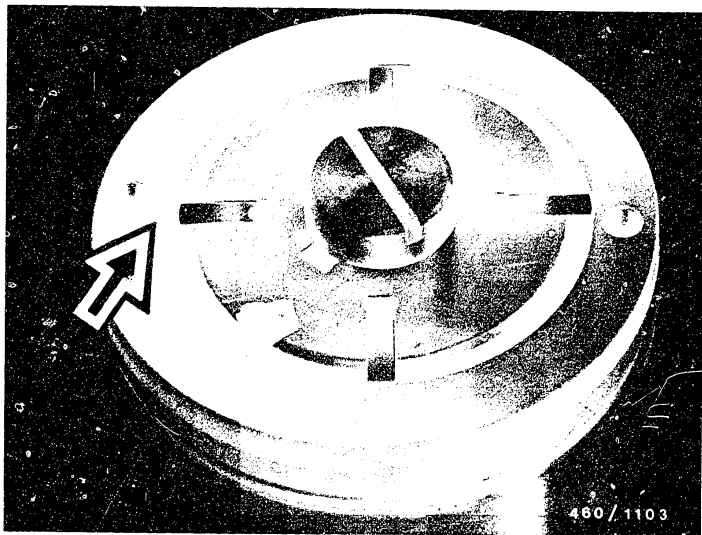
- 1 = Support ring - old version
- 2 = Support ring - new version
- 2a= Grooves (new)
- 3 = Slotted washer - old version
- 3a= Grooves (deleted)

### 11.1 Assembling the vane pump

On distributor-type injection pumps as of FD 349, the slotted washer and support ring have been changed to the effect that the grooves in the slotted washer are in future deleted and are shifted into the support ring (see picture).

Mounting the support ring with grooves (new version) with a slotted washer with grooves (old version) is possible, but not mounting of the support ring without grooves (old version) with a slotted washer without grooves (new version).





Place correct support ring with correct slotted washer and pump vane on assembly tool KDEP 1097 with holding mandrel.

Insert pump vane so that convex side is on the outside (see picture).

Position the supporting plate.

The two opposite bores in the support ring are at an unequal distance from the bearing surface of the pump vanes.

As a feature for installing the support ring, note the bore at the greater distance from the bearing surface (see picture, arrow).

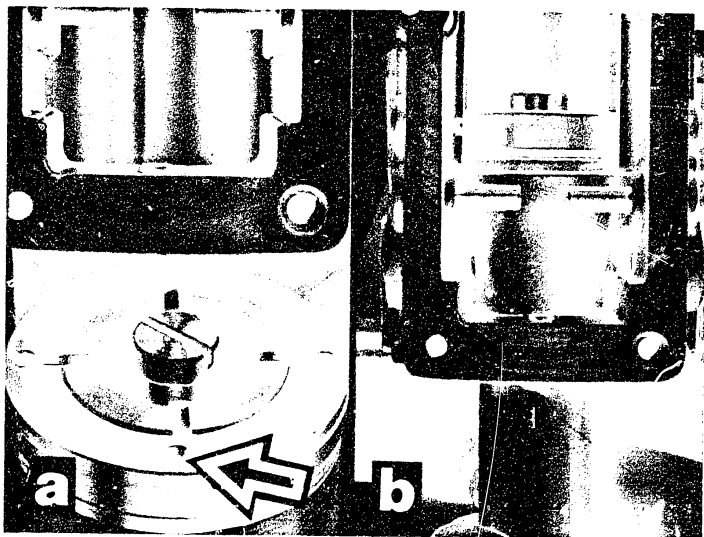
If the direction of rotation of the injection pump is given as "L", this bore must, as viewed looking onto the assembly tool, be on the left and, if the direction of rotation is "R", on the right.

**E13**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





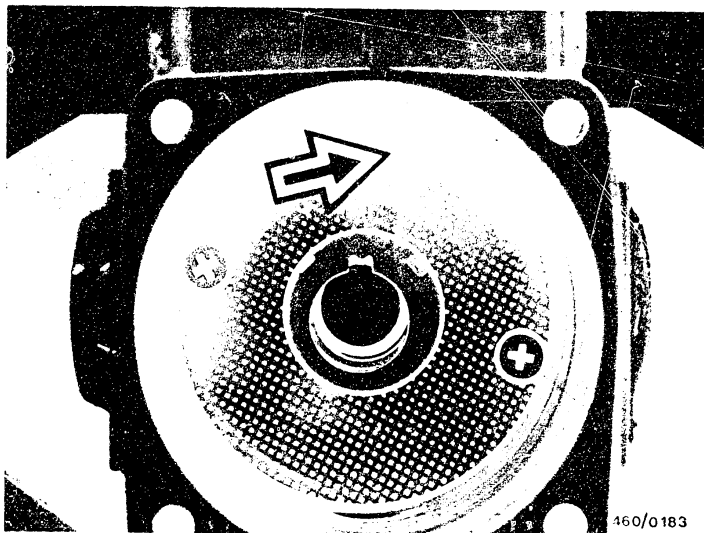
The center bore (see picture, arrow) must always point upward to the governor in the pump housing.

Introduce supply pump from below into pump housing using assembly tool KDEP 1097. Leave assembly tool in.

**E14**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Flat-head screws

Pivot pump housing upward through 180° and withdraw assembly tool.

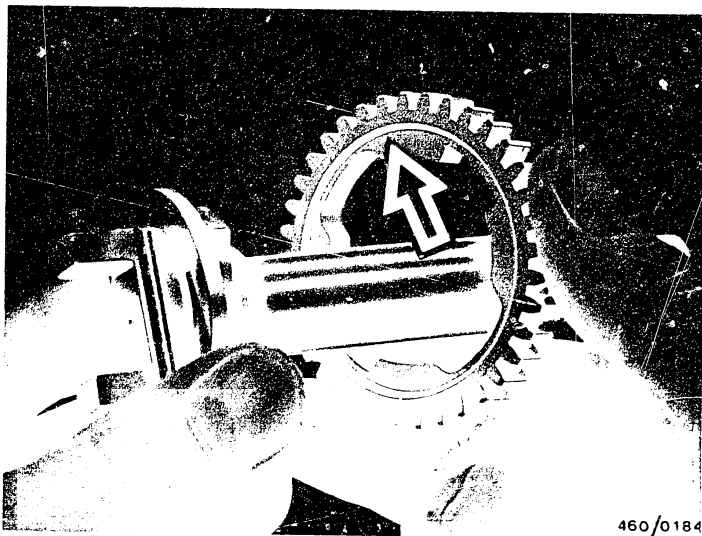
Before securing the support ring with flat-head screws, check whether all three bores are in alignment with the eccentric ring and whether the center bore (see picture, arrow) is pointing upward, to the governor.

**E15**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







460/0184

### 11.2 Assembling the drive shaft, installing the seal rings and shaft in the pump housing

Distributor-type injection pumps as of FD 723 are supplied without a spring pin on the drive shaft. In the case of distributor-type injection pumps before FD 723 it is not necessary to press in this spring pin when repairing.

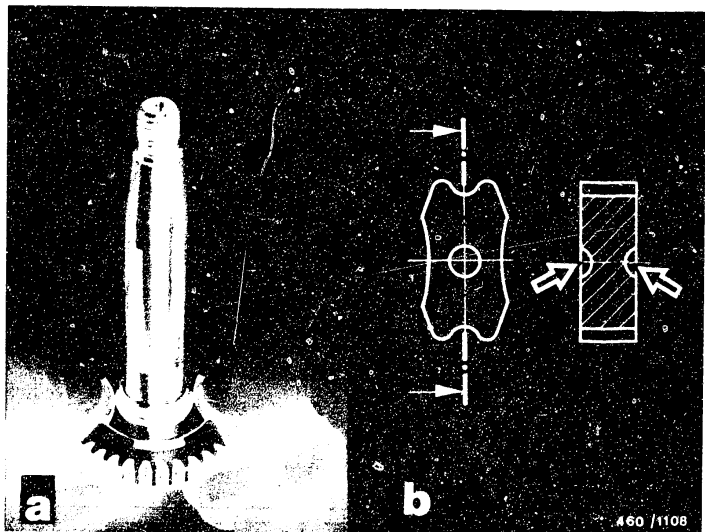
Slide toothed wheel onto drive shaft so that the recess in the toothed wheel points toward the claws of the drive shaft (see picture, arrow).

**E16**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





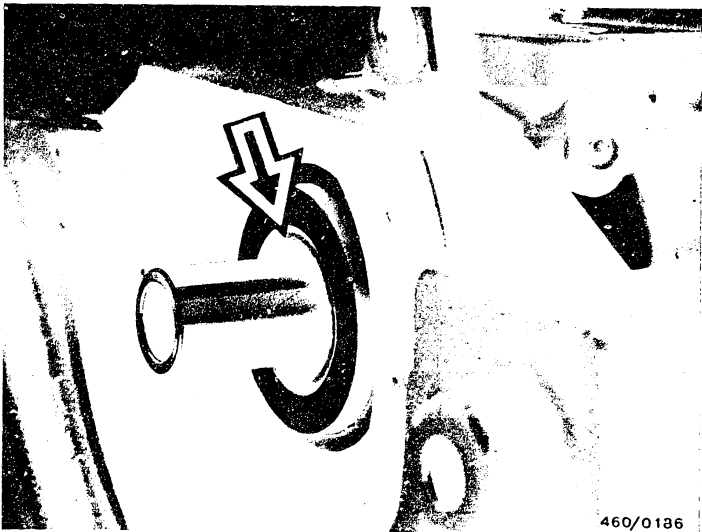
460 / 1108

To improve the resistance to wear, modified rubber buffers have been introduced. The new rubber buffers are identified by two indentations (see picture b, arrows). When repairing, use only rubber buffers according to the latest service-parts list. Press new rubber buffers by hand into the toothed wheel (see picture a). Using grease, stick slotted washer onto drive shaft and stick Woodruff key into drive shaft.

**E17**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





460/0186

Place pump housing in a horizontal position.

To protect the radial-lip-type oil seal (see picture, arrow), mount assembly sleeve.

Introduce preassembled drive shaft into pump housing so that the Woodruff key engages the groove of the impeller wheel.

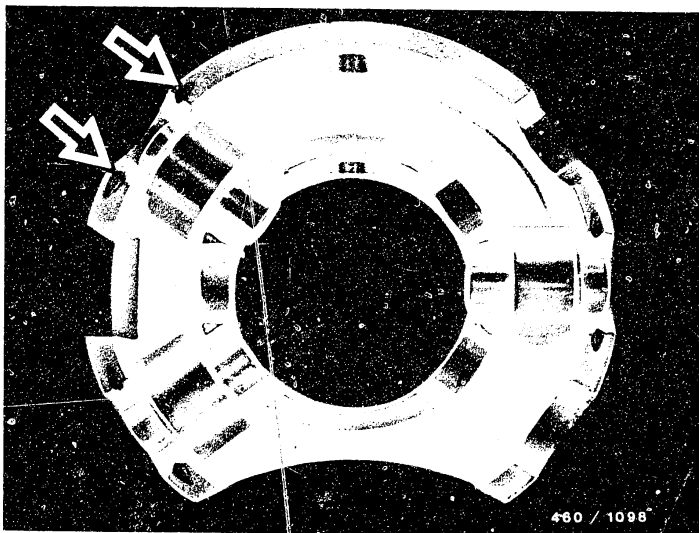
Place the pump housing in a vertical position.

**E18**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





### 11.3 Preparing the cam roller ring and inserting it into the pump housing

The rollers of the cam roller ring must not drop out or be mixed up.

If this is done, the height of the rollers must be measured again.

Maximum difference between the individual roller heights 0.02 mm.

In the case of cam roller rings with 3 rollers, note the installation position of the rollers.

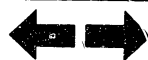
The bearing grooves in which the rollers are to be inserted are identified on the end face of the cam roller ring by ground-in notches (see picture, arrows).

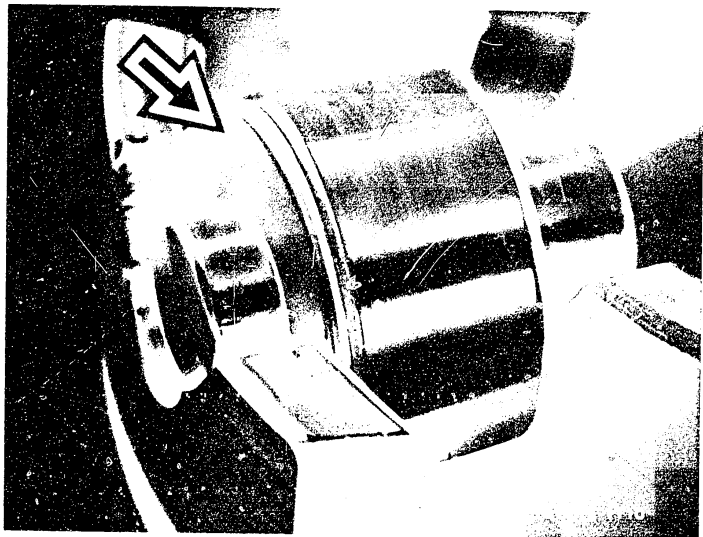
The other bearing grooves are left unoccupied.

**E19**

Assembling the fuel-injection pump

Distribution-type pump 0 460 4..



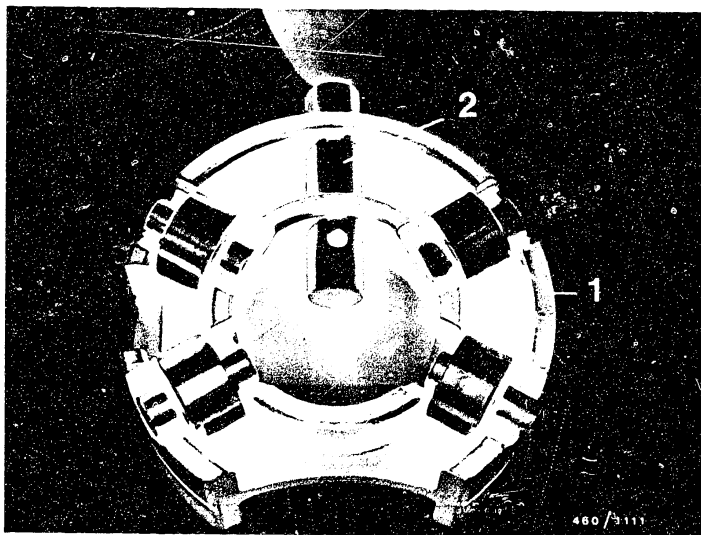


Note:

When mounting the rollers, make sure that the spring seats are installed on the outside of the rollers (see picture, arrow).

The conical side must point toward the outer ring.





- 1 = Cam roller ring  
2 = Sliding bolt

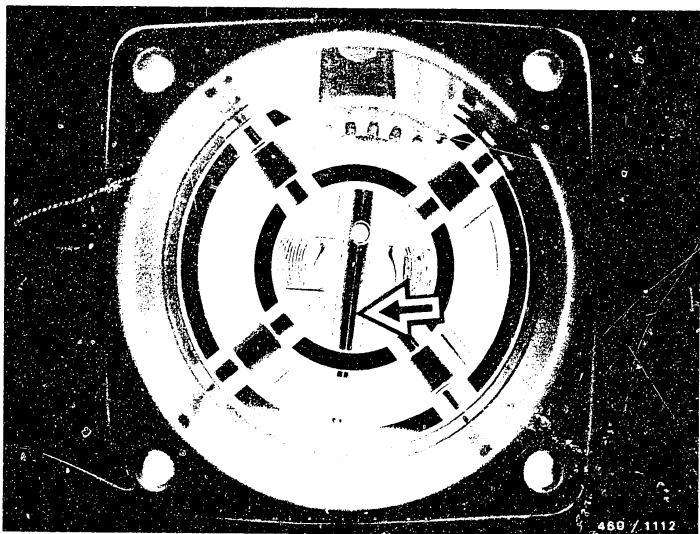
Slide the sliding bolt entirely into the cam roller ring with the transverse bore to the front. Position the transverse bore vertically.

Place the claws of the drive shaft parallel to the timing device.

**E21**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





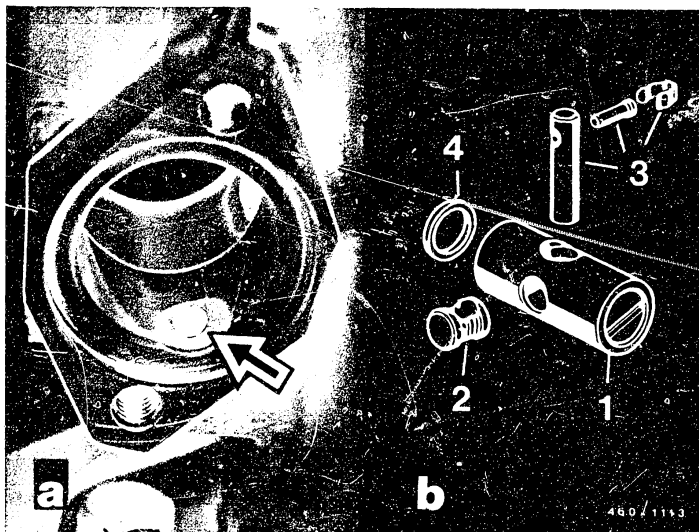
460 / 1112

Insert the cam roller ring into the pump housing so that the sliding bolt (see picture, arrow) points toward the timing device.

**E22**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Timing-device piston
- 2 = Sliding piece
- 3 = Sliding bolt with retaining pin and retaining bracket
- 4 = Shim

#### 11.4 Inserting the timing-device piston

Insert sliding piece and shim into timing-device piston with grease.

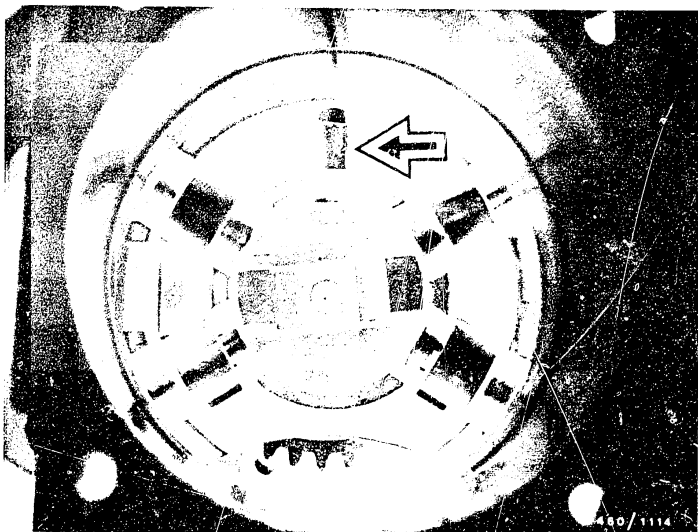
Slide timing-device piston into pump housing so that the open side for the compression spring points toward the return bore (see picture, arrow).

The bore of the sliding piece points toward the cam roller ring.

Slide the sliding bolt into the sliding piece of the timing-device piston and secure with retaining pin.







Mount retaining bracket (see picture, arrow) over sliding bolt on retaining pin.  
Check timing device for freedom of movement.

Mount timing-device cover with seal ring.

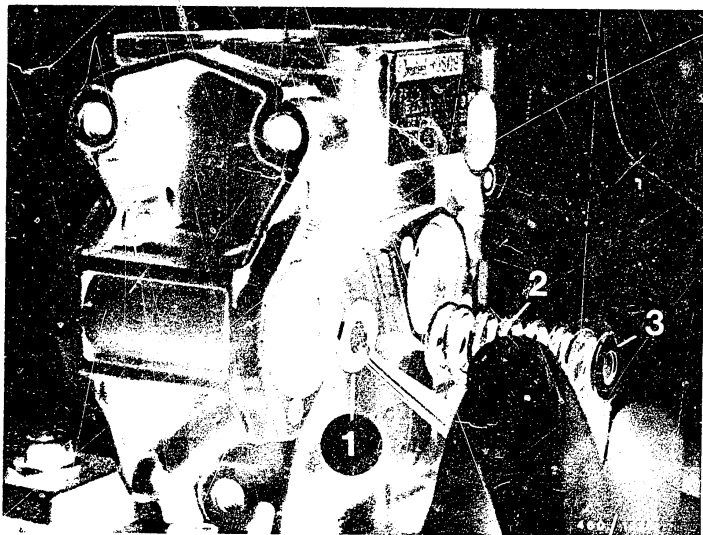
Note:

The timing-device travel is determined by the length of the piston and need not be measured.

**E24**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Shim plate
- 2 = Compression spring
- 3 = Shim

#### 11.5 Checking and adjusting the timing-device shim thickness "SVS"

Measure the thickness of the shim pack (consisting of item 1 and item 3 above). When doing this, be sure to take account of the shim plate in the timing-device piston. Compare with data in the corresponding test-specification sheet under "SVS". If necessary, add or remove shims.

Insert shim, 0.6 mm thick, in timing-device piston. Install compression spring, insert seal ring and install closing cover with remaining shims of dimension "SVS".

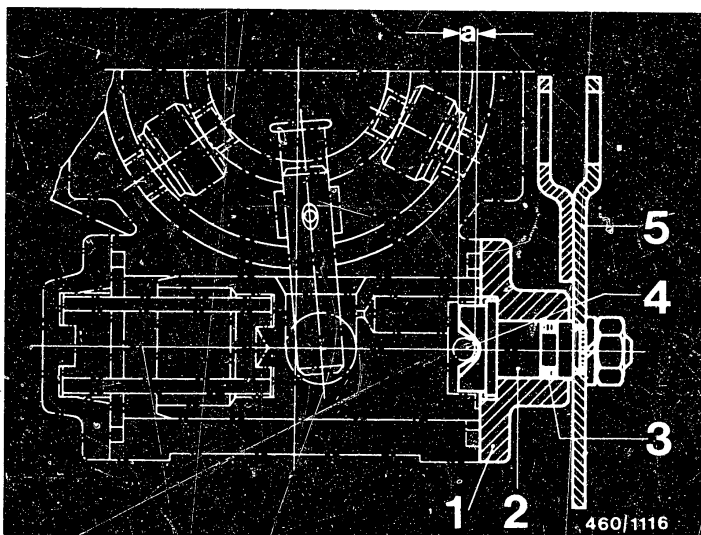
#### Note:

At least one shim must be installed, max. 3 mm thick, on each side of the compression spring.  
"SVS" is the maximum dimension.

**F1**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





a = Operating stroke  
 1 = Closing cover  
 2 = Shaft  
 3 = O-ring

4 = 4 mm pin on timing-  
 device piston  
 5 = Stop lever

### 11.6 Installing the mechanically actuated cold-start accelerator (KSB)

Mount the cold-start accelerator, if applicable, on the pressure side of the timing device.

Install shaft with O-ring in closing cover.

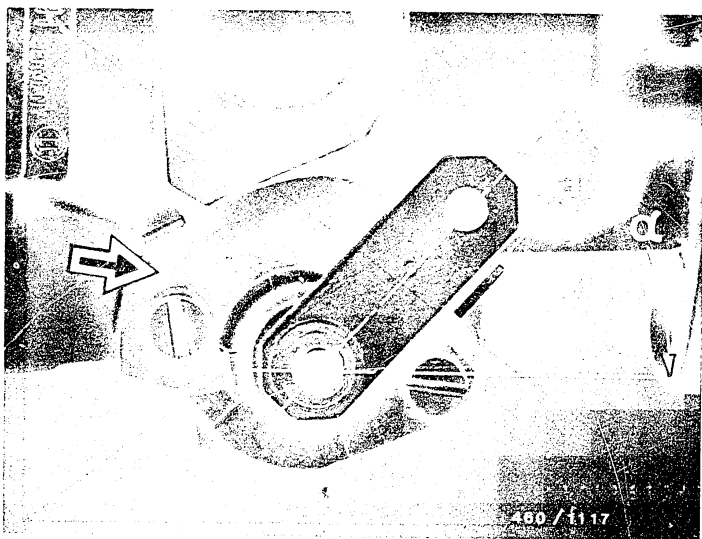
Mount closing cover on pump housing (timing device) with stop plate.

Make basic setting of stop lever.

**F2**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





### Basic setting of stop lever

Note:

There are two versions of stop plate. Version 1, see picture, arrow.

Turn cold-start accelerator shaft by hand in working direction until the cam is noticeably up against the 4 mm pin of the timing-device piston.

Mount the stop lever at angle  $\alpha$  (alpha) in the working direction (see picture).

Angle  $\alpha$  is in the test-specification sheet.

With the lever in this position, adjust the stop plate to 1 mm play (a).

a = 1.0 mm before start of timing-device stroke

Note:

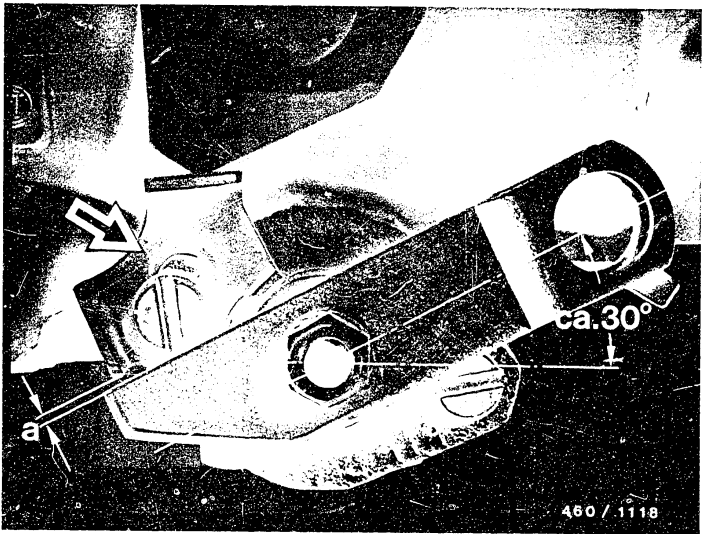
When mounting the stop lever, pay attention to the correct installation position.

**F3**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





### Basic setting of stop lever

#### Version 2

Turn cold-start accelerator shaft by hand in the working direction until the cam is noticeably up against the 4 mm pin of the timing-device piston.

Adjust stop plate to 1 mm play (a) (see picture).

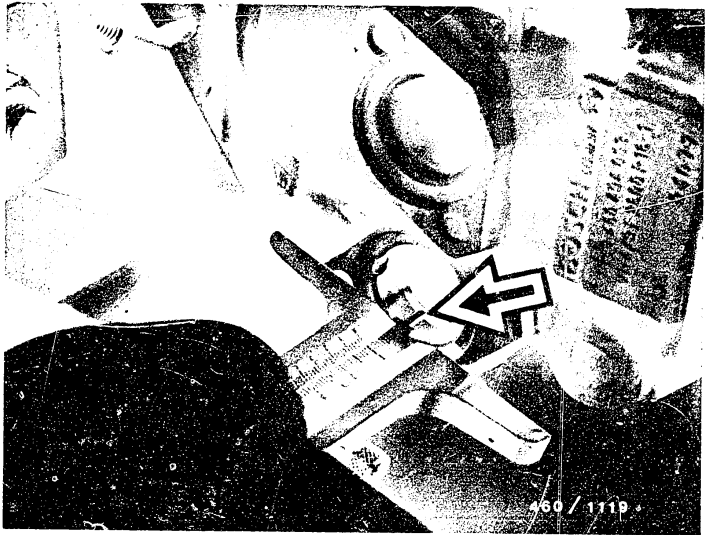
With this version, this setting provides an angle of 30°.

a = 1.0 mm before start of timing-device stroke.

#### Note:

When mounting the stop lever, pay attention to the correct installation position.





### Measuring the operating stroke

Remove the cover assembly on the spring side of the timing device.

Take out spring and seal ring.

Bring cold-start accelerator cam into BDC position by turning the stop lever, while at the same time pressing the timing-device piston against the cam on the spring side.

Using a depth gauge, measure the distance between housing and timing-device piston (dimension 1) (see picture, arrow).

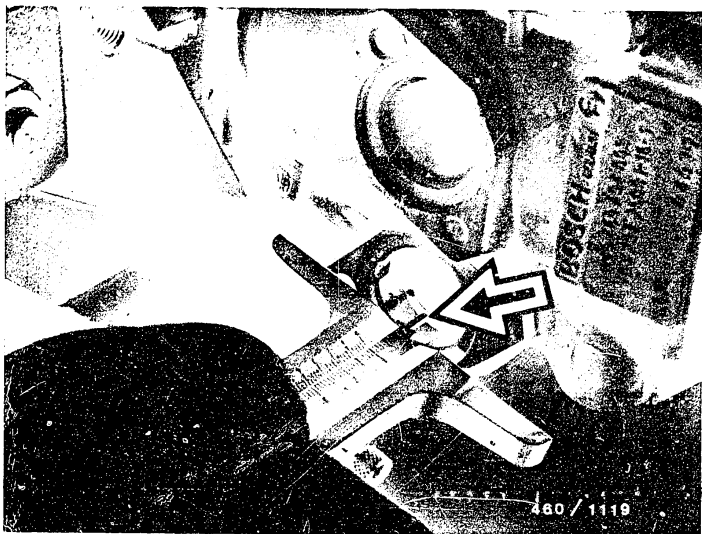
Bring cam into TDC position by turning the stop lever, while again pressing the timing-device piston against the cam.

Once again, measure the distance between housing and timing-device piston (dimension 2).

**F5**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





The difference between dimension 1 and dimension 2 yields the operating stroke (see test-specification sheet).

Mount spring, seal ring and timing-device cover.

Loosen fastening screws of cold-start accelerator cover by half a turn.

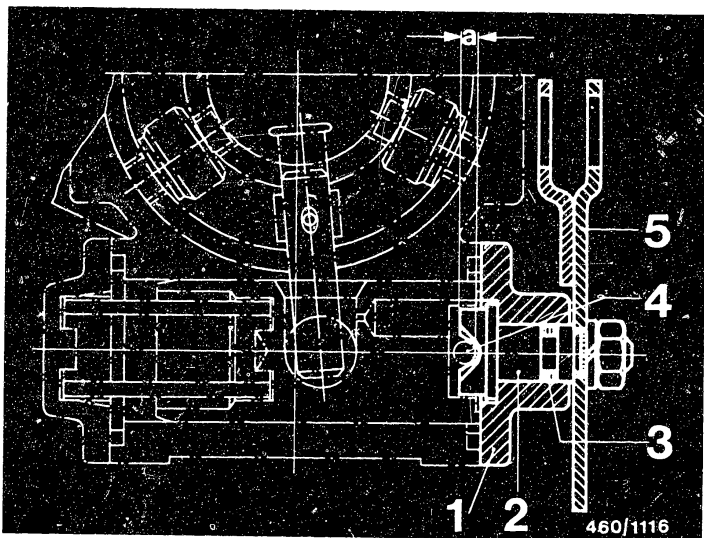
Turn stop lever in working direction until just before TDC position of cold-start accelerator.

(This operation is important for centering the cam in relation to the 4 mm pin in the timing-device piston,)

**F6**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





a = Operating stroke  
 1 = Closing cover  
 2 = Shaft  
 3 = O-ring

4 = 4 mm pin on timing-device  
 piston  
 5 = Stop lever

Tighten both fastening screws of cover to a tightening torque of 6 ... 9 Nm. Bring stop lever into starting position (BDC).

Loosen fastening screw of stop plate by half a turn. Actuate stop lever as far as start of timing-device stroke. With the lever in this position, adjust the stop plate to 1 mm play before start of timing-device stroke.

Note:

Depending on the version of stop plate, the play a (1 mm) between stop lever and stop plate is set once on the left-hand lever arm and once on the right-hand lever arm.

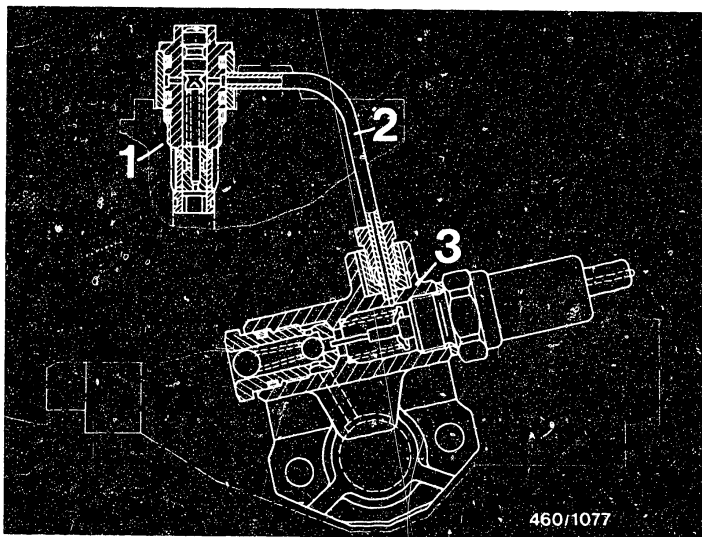
Tighten fastening screw of stop lever to a torque of 6 ... 9 Nm.

**F7**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





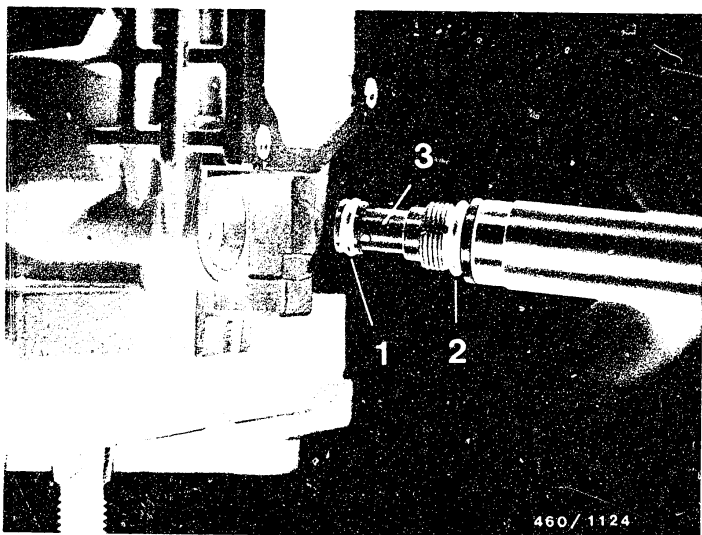


- 1 = Pressure regulator
- 2 = Ring main
- 3 = Cold-start accelerator control valve

### 11.7 Mounting the hydraulically actuated cold-start accelerator

Mount the cold-start accelerator control valve on the spring side of the timing device.





- 1 = O-ring
- 2 = O-ring
- 3 = Pressure regulator

Installing the pressure regulator for the hydraulically actuated cold-start accelerator

Fit O-rings on pressure regulator.

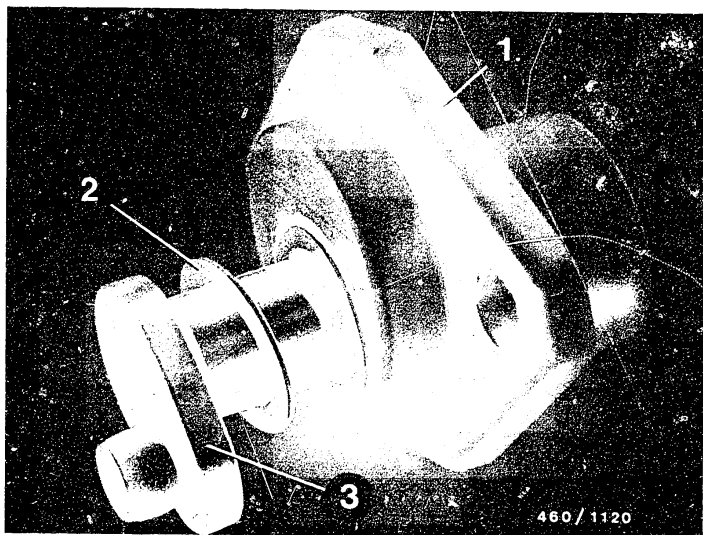
Using socket wrench KDEP 1086, screw pressure regulator into pump housing.

Mount ring main for cold-start accelerator control valve.

**F9**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Fitting cover
- 2 = Shim
- 3 = Control lever shaft

### 11.8 Mounting the temperature-controlled cold-start accelerator (KSB)

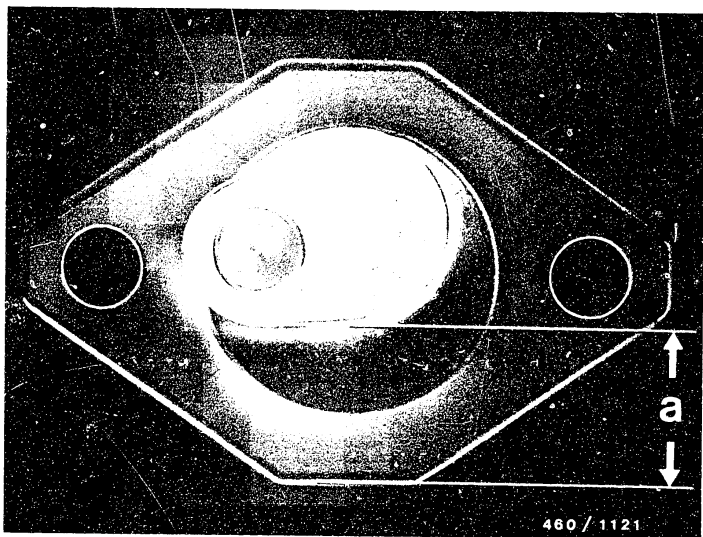
Introduce control lever shaft with shim into fitting cover.

Insert O-ring in recess of fitting cover on control lever side and press completely into the seat.

**F 10**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Pivot the fitting cover so that the inside of the cover with the ball stud of the control lever shaft is pointing upward (see picture).

The guide bore of the control lever shaft is eccentric in the fitting cover.

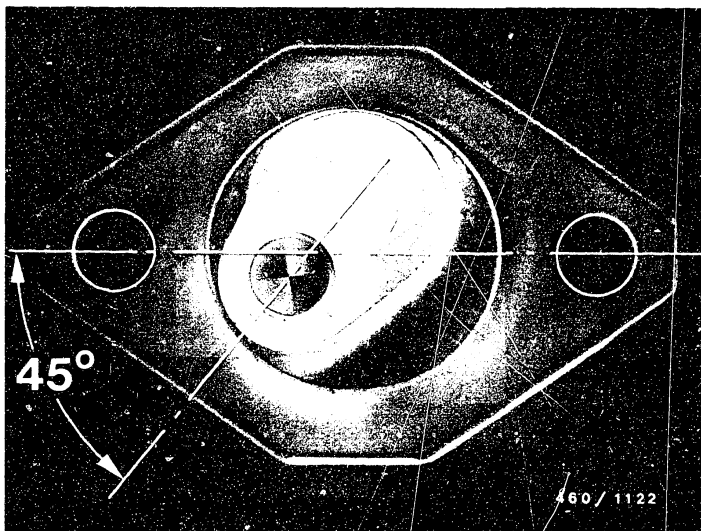
When looking onto the fitting cover, the greater distance between edge of cover and edge of bore must point toward the body (a).

**F11**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..



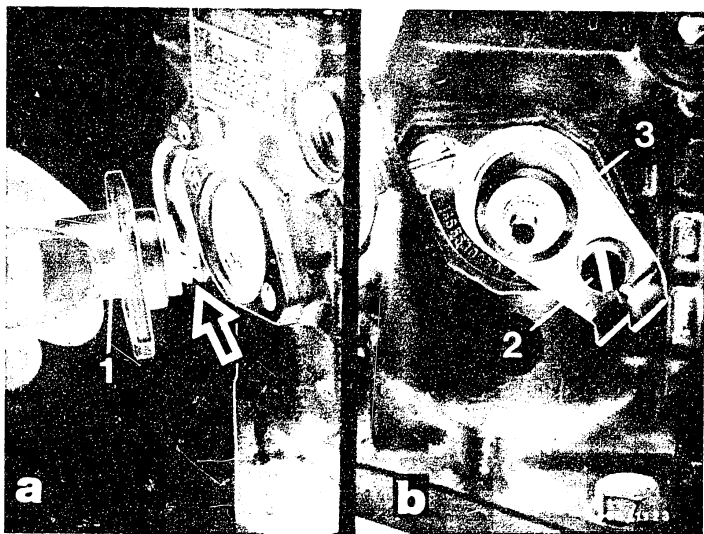


Pivot control lever shaft to approx.  $45^{\circ}$  with respect to the transverse axis of the fitting cover (see picture).

**F12**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Fitting cover
- 2 = Fastening screws
- 3 = Stop bracket

Insert O-ring in pump housing.

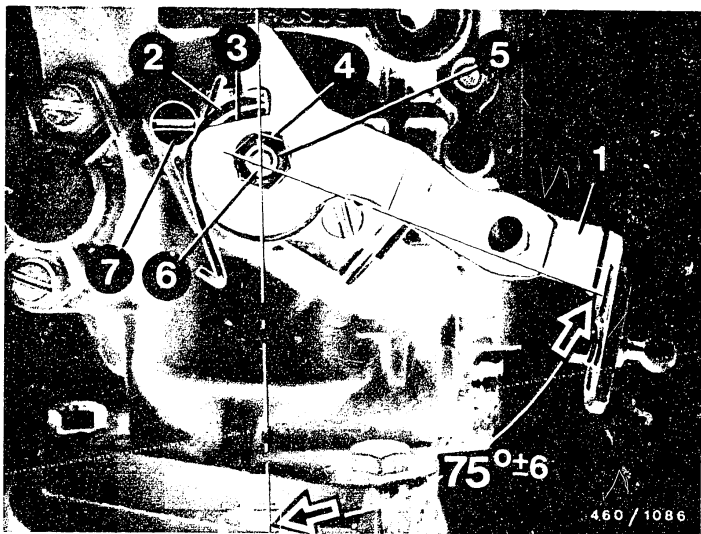
Mount fitting cover and stop bracket on pump housing with fastening screws.

The ball stud of the control lever shaft (see picture a, arrow) points toward the pump drive side.

**F13**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- |  |                          |
|--|--------------------------|
| 1 = Control lever                        | 5 = Hexagon nut          |
| 2 = Cylindrical helical<br>coiled spring | 6 = Control lever shaft  |
| 3 = Shim                                 | 7 = Fillister-head screw |
| 4 = Spring lock washer                   |                          |

Turn control lever shaft by hand in direction of arrow until there is noticeable contact with the cam roller ring.

Mount cylindrical helical coiled spring and shim.

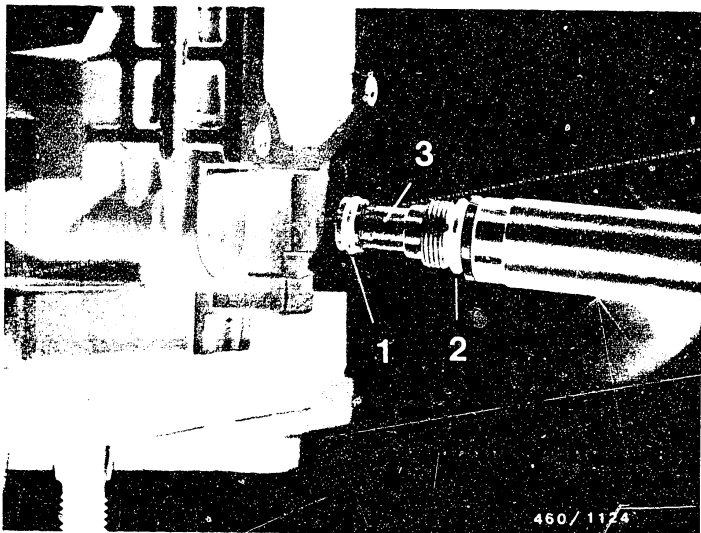
Mount control lever on control lever shaft at an angle of  $75 + 6^\circ$  with respect to the longitudinal axis of the pump and tighten with hexagon nut.

**F14**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





- 1 = O-ring
- 2 = O-ring
- 3 = Pressure regulator

### 11.9 Installing the pressure regulator

Fit O-rings on pressure regulator.

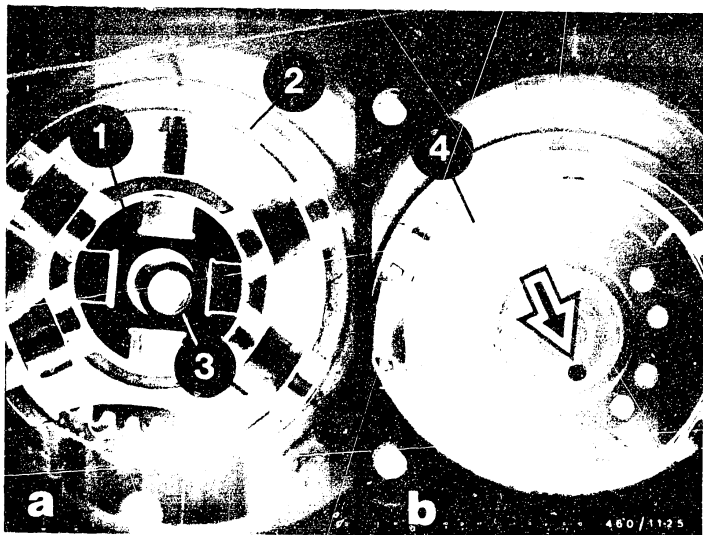
Using socket wrench KDEP 1086, screw pressure regulator into pump housing.

**F15**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







1 = Slotted washer  
2 = Cam roller ring

3 = Compression spring  
4 = Cam plate

#### 11.10 Installing the slotted washer, cam plate and solenoid-operated valve

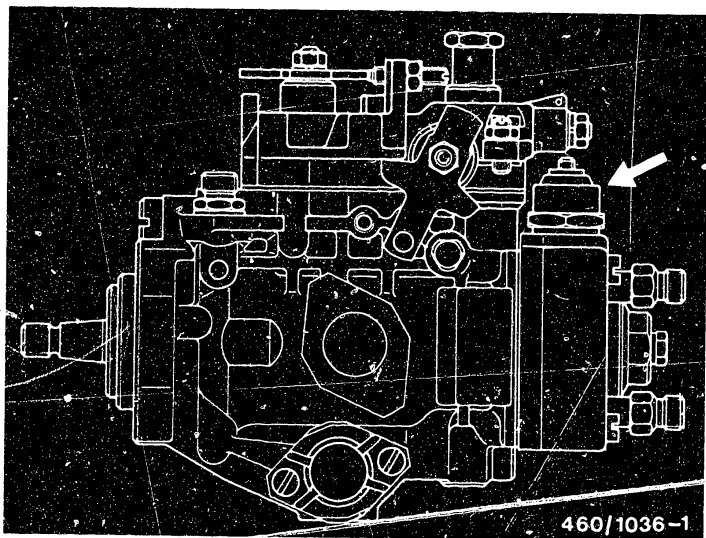
Insert slotted washer in cam roller ring. Pay attention to the following installation position:

If a compression spring is installed between slotted washer and cam plate, the recess for it in the slotted washer must point upward (see picture a). Insert cam plate so that the driver pin points in the direction of the Woodruff key groove of the drive shaft (see picture b, arrow).

**F 16**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





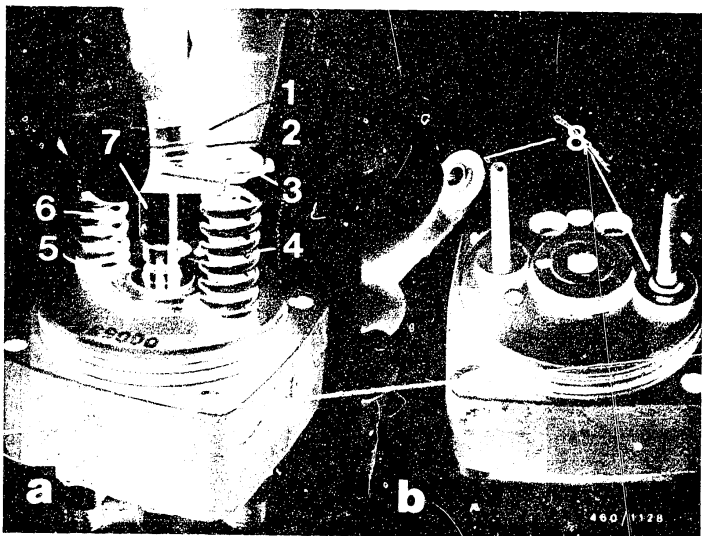
Install solenoid-operated valve, if applicable, with O-ring in hydraulic head (see picture, arrow).

Tighten to a torque of 15 ... 25 Nm.

**F17**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Shim  
 2 = Slotted washer  
 3 = Spring seat  
 4 = Compression spring

5 = Spring seat  
 6 = Guide pin  
 7 = Distributor-pump  
 plunger  
 8 = Spring seat

### 11.11 Establishing the plunger spring dimension "KF"

Insert guide pins into hydraulic head. Slip both lower spring seats without shim rings onto guide pins.

Note:

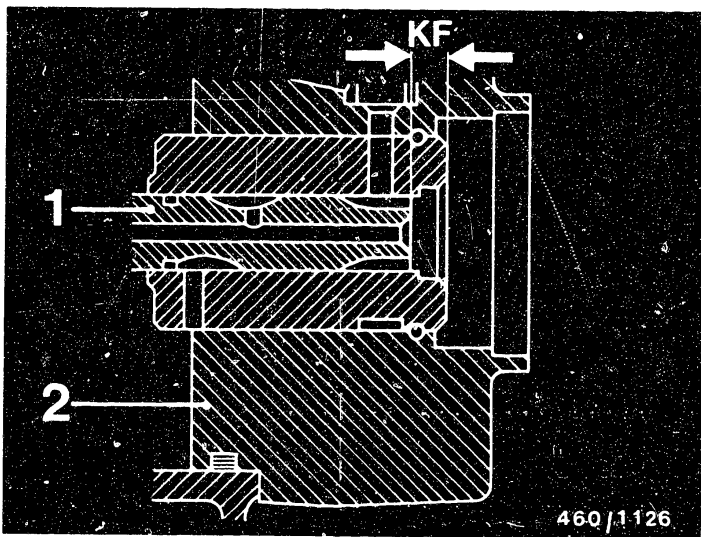
Shim rings are under spring seat (see picture b).

Position compression springs.

Lay shim, slotted washer and spring seat on distributor-pump plunger.

Introduce distributor-pump plunger assembly into hydraulic head.





- 1 = Distributor-pump plunger  
 2 = Hydraulic head

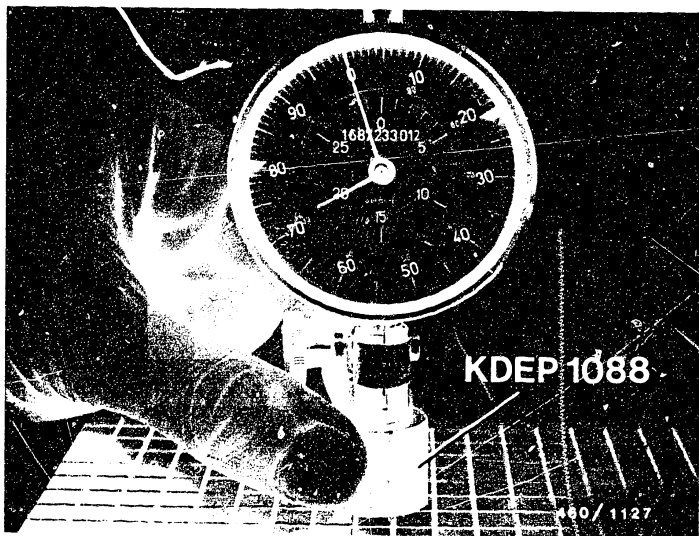
Dimension "KF" is the distance between the end sealing surface of the hydraulic head and the end face of the distributor-pump plunger (see picture).

It is measured using dial indicator and holder (KDEP 1088).

**F19**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





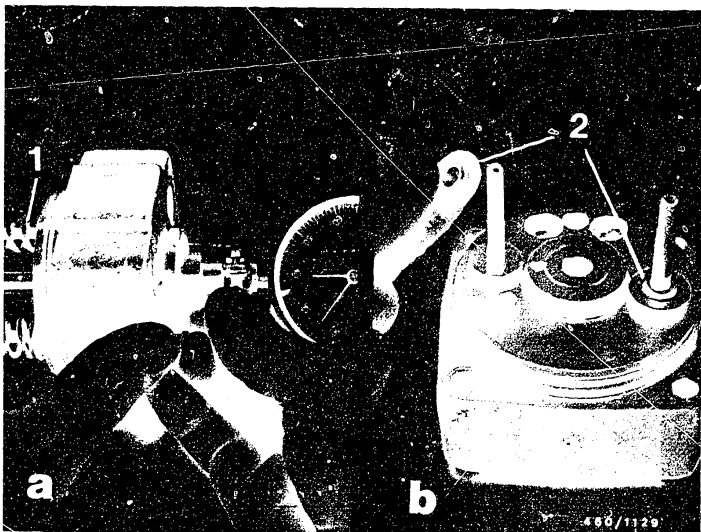
Clamp dial indicator 1 687 233 012 with measuring insert  
in holder KDEP 1088.

Place holder on marking-out plate, preload dial indi-  
cator by approx. 20 mm and set to "0".

**F20**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Compression springs

2 = Spring seats

Hold hydraulic head horizontal (see picture).  
Lay holder KDEP 1088 flat on sealing surface in hydraulic head.

By means of axial pressure on the distributor-pump plunger base, contact the compression springs (do not over-compress springs).

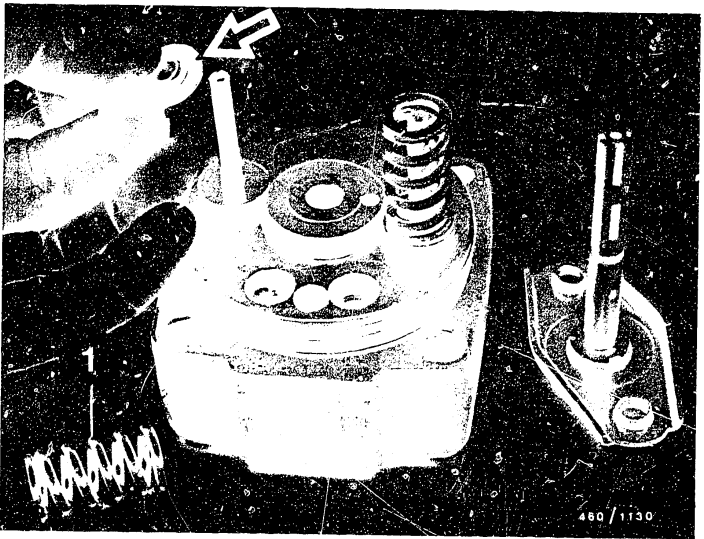
Compare the measured dimension (red figures on dial indicator) with the specified "KF" dimension given in the test-specification sheet. If necessary, compensate with appropriate shim rings (under spring seat).  
If the choice is between 2 thicknesses, choose the thicker shim ring.

**F21**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = Compression springs

Note:

There must be only one shim ring of equal thickness on either side (is already on guide pin in picture, arrow = spring seat).

Withdraw distributor-pump plunger out of hydraulic head and put down other parts.

Note:

Compression springs may only be exchanged in pairs (parts set).



11.12 Assembling the housing cover - variable-speed governor

Slip shim onto control lever shaft. Fit O-ring with assembly sleeve KDEP 2937.

Pull control lever shaft through housing cover with assembly wrench KDEP 1096.

Mount cylindrical helical coiled spring, if applicable, with shim, control lever, spring lock washer and hexagon nut. Position control lever parallel to the lever of the control lever shaft.

11.13 Assembling the housing cover - part-load governor

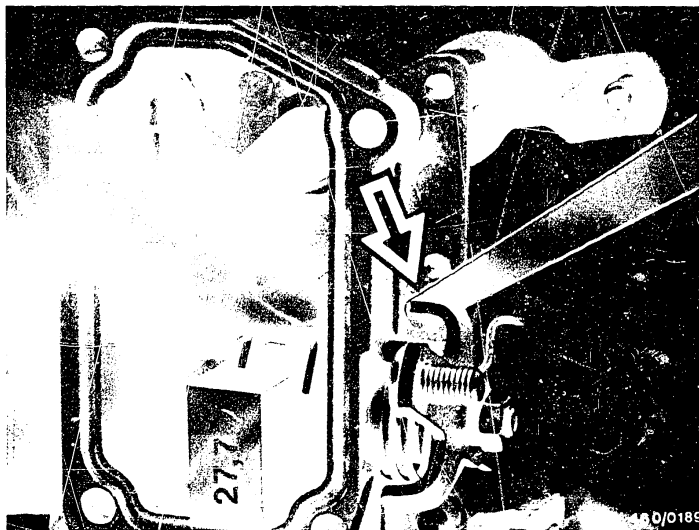
Slip shim onto control lever shaft. Fit O-ring with assembly sleeve KDEP 2937.

Pull control lever shaft through housing cover with assembly wrench KDEP 1096.

Mount cylindrical helical coiled spring and both control levers and hexagon nut with spring lock washer. Position control lever on control lever shaft so that marks on control lever and control lever shaft are in alignment.







#### 11.14 Adjusting the mechanical shutoff device

If the mounting position of the stop lever in relation to the lever shaft was not marked, it is necessary to measure out the relationship.

Place spacer KDEP 1130 between inside edge of housing cover and inner stop lever.

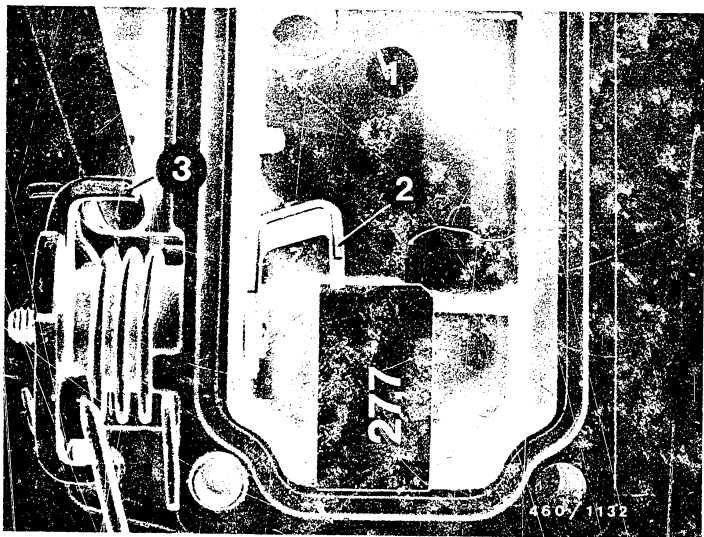
Position control lever so that there is a gap in respect of the housing (2-5 mm, see picture, arrow).

**F24**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





- 1 = Housing cover
- 2 = Lever shaft
- 3 = Regulating lever

11.15 Relationship of regulating lever to lever shaft in injection pump with temperature-controlled starting fuel delivery (TAS)

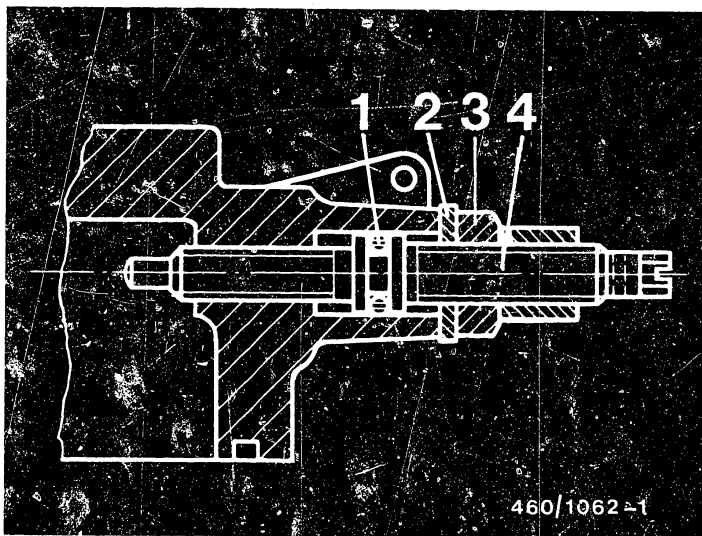
Introduce lever shaft into housing cover. If the mounting position of the regulating lever with respect to the lever shaft was not marked, it is necessary to measure out the relationship.

Place spacer KDEP 1130 between inside edge of housing cover and regulating lever (see picture). Position regulating lever so that there is a minimal gap, but at least 3 mm, between regulating lever and housing cover. Measure the gap with a feeler gauge and make a note of the measurement.

**G1**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





- 1 = O-ring
- 2 = Plain washer
- 3 = Hexagon nut
- 4 = Threaded pin

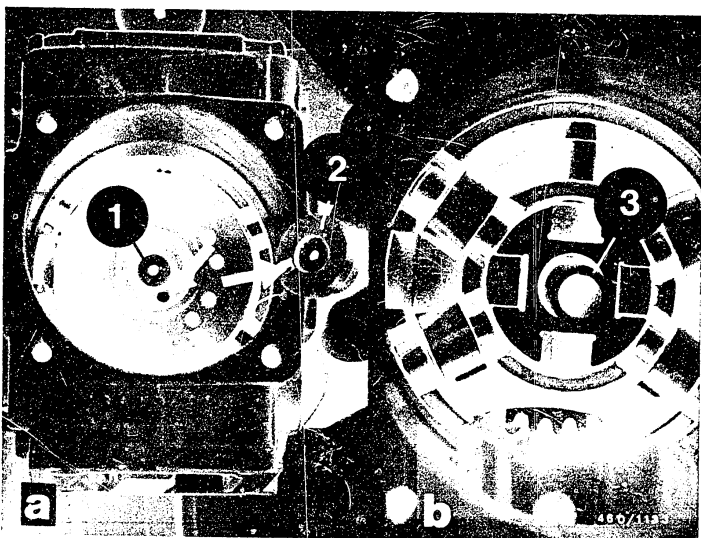
Screw in new threaded pin with O-ring, plain washer and hexagon nut.

Insert seal ring in housing cover (not shown).

**G2**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Shim  
 2 = Distributor-pump plunger base  
 3 = Compression spring

11.16 Adjusting the position of the distributor-pump plunger:

Distributor-type pumps without prestroke:

Dimension "K" is established with KDEP 1088. See specification for dimension "K" in test-specification sheet.

Insert any shim, dry, in base of plunger: Do not stick with grease etc.

Note:

Compression spring, if applicable, must not have been inserted.

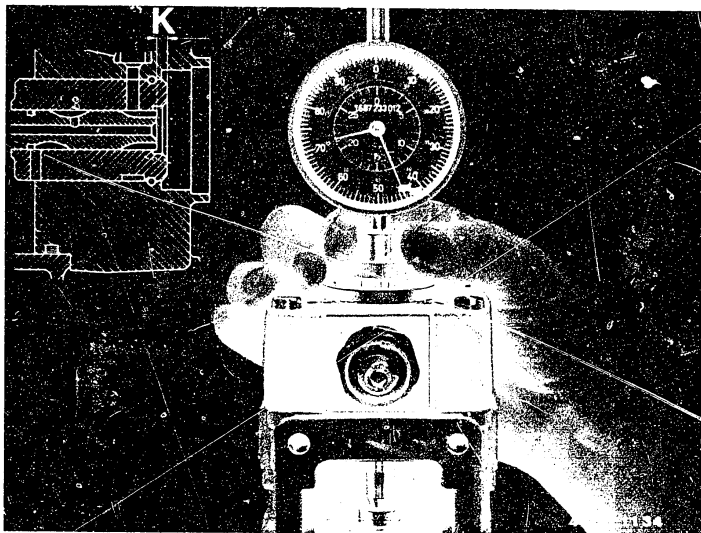
Insert distributor-pump plunger with shim into cam plate so that the driver pin of the cam plate comes into the recess of the plunger base (see picture a, arrows).

**G3**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





Introduce hydraulic head carefully and without tilting over distributor-pump plunger into housing and secure with screws.

Measure dimension "K" (plunger dimension).

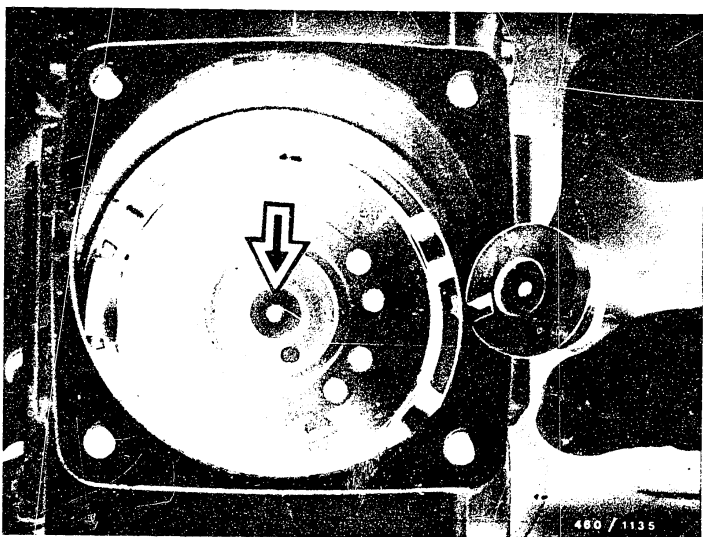
Dimension "K" is the distance between the end sealing surface of the hydraulic head and the end face of the distributor-pump plunger.

Bring distributor-pump plunger into BDC position.

**G4**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





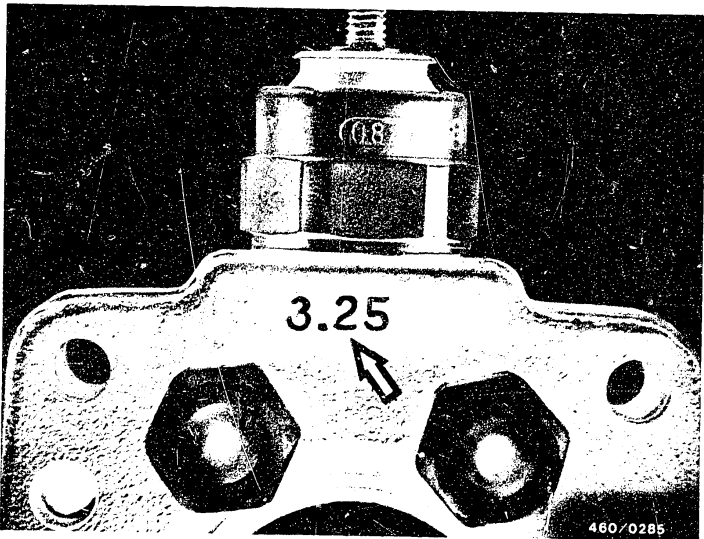
Compare the measured dimension (red figures on dial indicator) with the specified "K" dimension given in the test-specification sheet and compensate with appropriate shim (see picture, arrow) in the base of the plunger.

If the measured dimension is greater than the specified "K" dimension, use a thicker shim; if it is smaller than the specified dimension, use a thinner shim. Then check dimension "K" again.

**G5**

Assembling the fuel-injection pump  
Distributor-type pump 0 460.4..





11.17 Establishing dimension "K1"  
Pump with quiet-idle device

In these pumps, dimension "K" which has been previously described is replaced by dimension "K1".

In this case, the test-specification sheet contains no specifications either under dimension "K" or under "prestroke".

Dimension "K1" is therefore stamped on the hydraulic head under the solenoid-operated valve (see picture, arrow).

Example:

Stamped number = 3.25

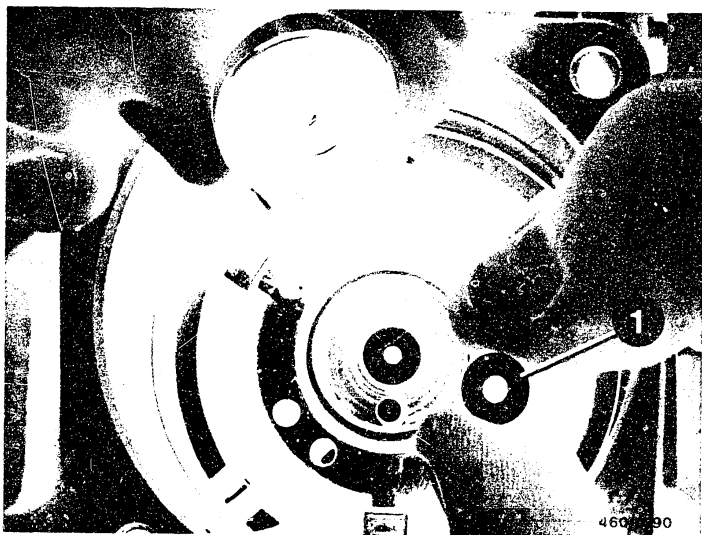
Dimension "K1" = 3.25 mm

**G6**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = Shim

Insert any shim, dry, in base of plunger. Do not stick with grease etc.

Note:

Compression spring, if applicable, must not have been inserted under the cam plate.

Insert distributor-pump plunger with shim in cam plate so that the driver pin of the cam plate comes into the recess of the plunger base.

Introduce hydraulic head carefully and without tilting over distributor-pump plunger into housing and tighten with fastening screws.

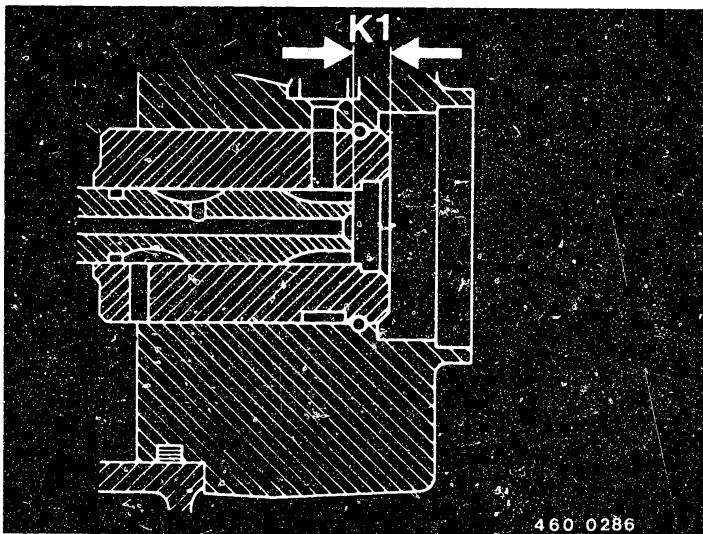
**G7**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..







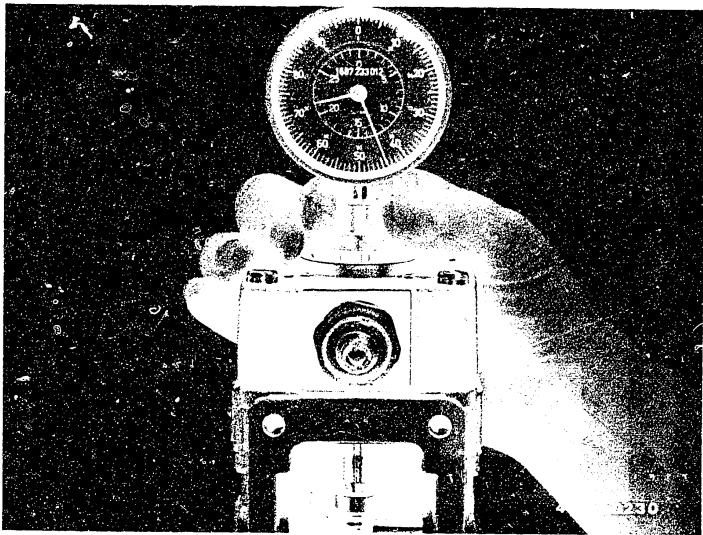
Dimension "K1" is the distance between the end sealing face of the hydraulic head and the end face of the distributor-pump plunger.

Bring the distributor-pump plunger into BDC position.

**G8**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Dimension "K1" is measured with KDEP 1088.

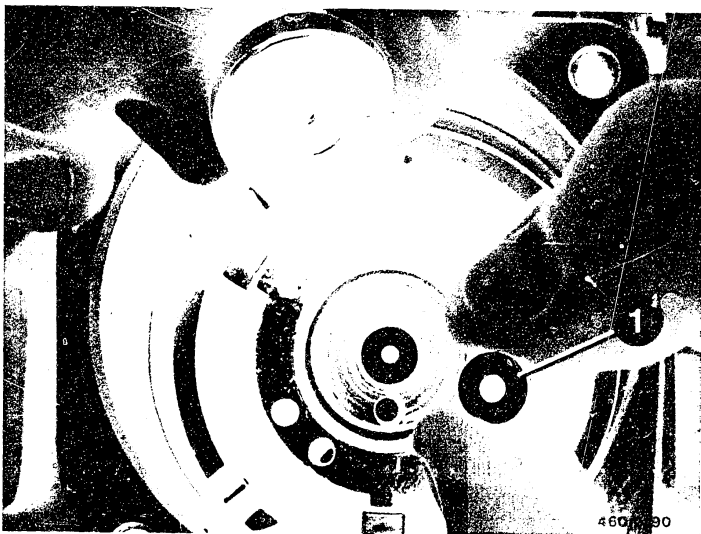
Compare the measured dimension (red figures on dial indicator) with the specified "K1" dimension stamped on the hydraulic head, and compensate with appropriate shim in the base of the plunger.

If the measured dimension is greater than the specified "K1" dimension, use a thicker shim; if it is smaller than the specified dimension, use a thinner shim. Then check dimension "K1" again.

**G9**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





### 11.18 Setting the prestroke

Distributor-type pump with prestroke (see test-specification sheet):

The measurement is performed hydraulically on the test bench.

Insert any shim, dry, into base of plunger; do not stick with grease etc.

Mount O-ring.

#### Note:

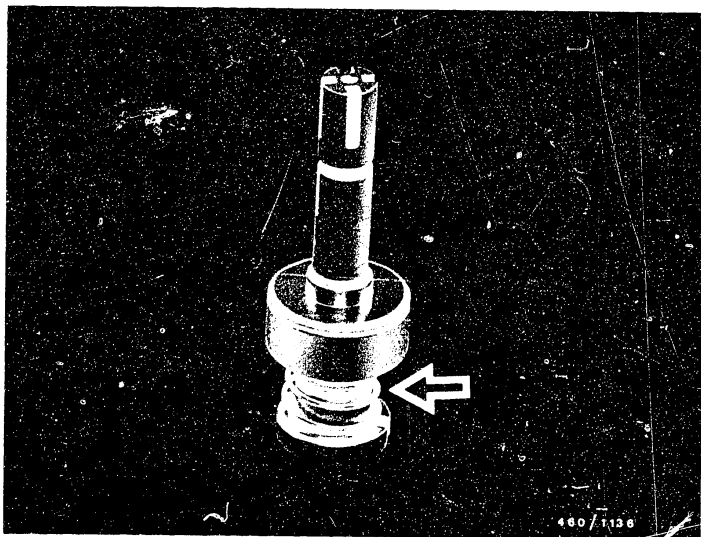
Compression spring, if applicable, must not have been installed.

**G10**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..



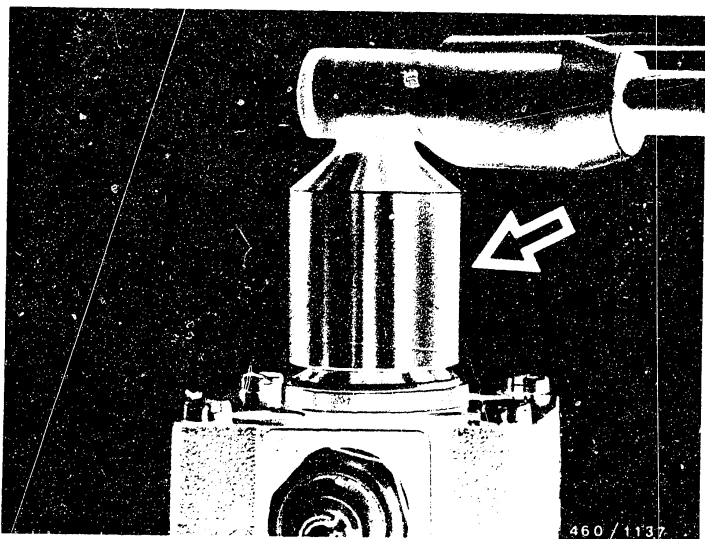


Insert distributor-pump plunger with shim in cam plate so that the driver pin of the cam plate comes into the recess of the plunger base. An auxiliary compression spring (see picture, arrow) must have been installed between plunger base and slider so that the slider is always pressed against the hydraulic head during measuring. Mount slider on plunger.

**G11**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Introduce hydraulic head carefully and without tilting over distributor-pump plunger into housing and secure with screws.

Using wrench KDEP 1080 (see picture, arrow), screw new central screw plug with seal ring into hydraulic head. Tightening torque 60 ... 80 Nm.

**G12**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



### Installing the delivery valves

Before installing the delivery valves, note the following information:

#### 1. Modified gaskets on delivery valves

As of FD 925 (May 79) all distributor-type fuel-injection pumps have been equipped with bronze gaskets instead of the previously used copper gaskets.

When repairing distributor-type fuel-injection pumps with an older FD, it is likewise possible to use bronze gaskets.

It is permissible to use up the copper gaskets.

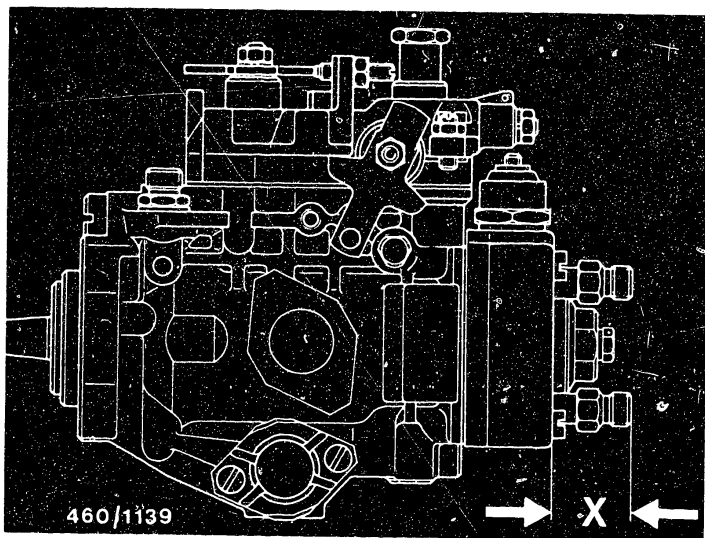
Use only gaskets of the same type, either copper or bronze, in one and the same hydraulic head.

**G13**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





2. Modified delivery-valve holders and delivery-valve carriers on distributor-type pumps with return flow restriction.

Distributor-type fuel-injection pumps with return flow restriction differ from the other versions by their long delivery-valve holders.

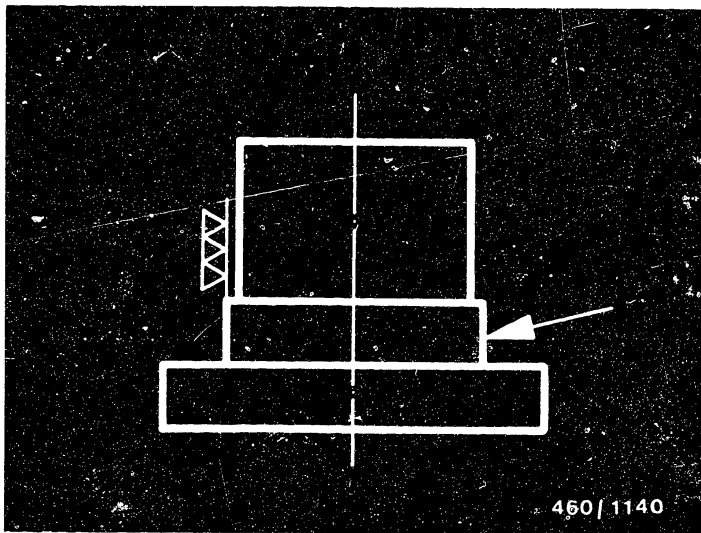
The dimension "X" between the end face of the delivery-valve holder and the hydraulic head (see picture) is:

- a) Pumps with return flow restriction      approx. 39 mm
- b) Pumps without return flow restriction      approx. 28 mm

**G 14**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





As of FD 041 (Jan. 80) distributor-type fuel-injection pumps with return flow restriction have been provided with modified delivery-valve carriers and delivery-valve holders with reduced play.

Delivery-valve carriers for reduced play are identified by a ground collar on the circumference (see picture, arrow).

**G15**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





In distributor-type pumps with these delivery-valve carriers, use only delivery-valve holders 1 463 370 330 or 1 463 370 326, depending on the information in the service-parts list.

In pumps whose delivery-valve carrier exhibits an un-ground collar, install only delivery-valve holders 1 463 370 324 or 1 463 370 323, depending on the information in the service-parts list.

Note:

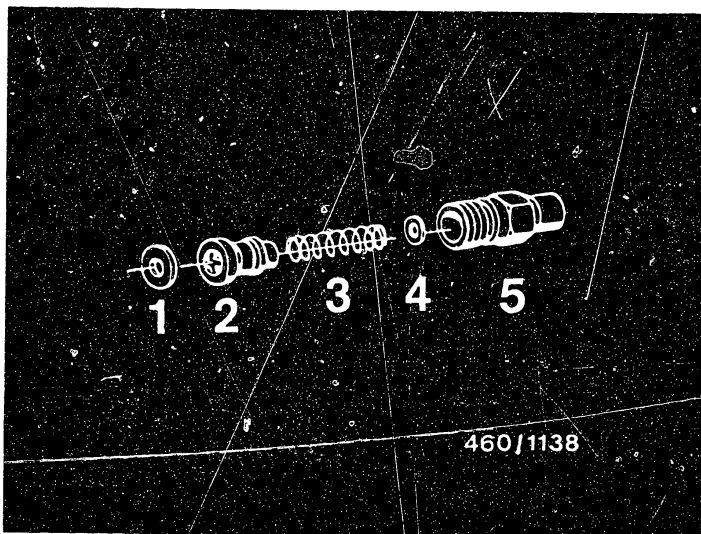
Whenever carrying out repairs, note the information in the latest service-parts list.

**G 16**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





460/1138

1 = Gasket  
 2 = Delivery valves  
 3 = Compression spring

4 = Shim  
 5 = Fitting

Install delivery valves with gasket, compression spring, shim and fitting in hydraulic head.

The tightening torque for used delivery-valve holders is: 38 ... 42 Nm.

The tightening torque for new delivery-valve holders which are being screwed into a new hydraulic head is: 38 ... 48 Nm.

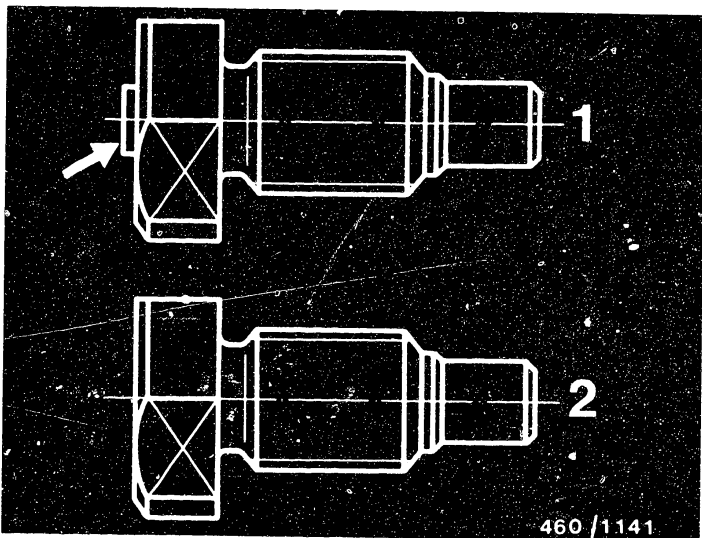
Removed (deformed) delivery-valve holders may only be used again if:

- \* The sealing edge is not damaged, cracked or broken.
- \* Lip of sealing edge is only slightly deformed without any visible step.
- \* Valve carriers are not seized in delivery-valve holders.

**G17**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





- 1 = New slotted shoulder screw  
2 = Old slotted shoulder screw

Provisionally screw governor shaft with O-ring and slotted shoulder screws with flat seal ring into housing.

Before installing the governor shaft, note the following information:

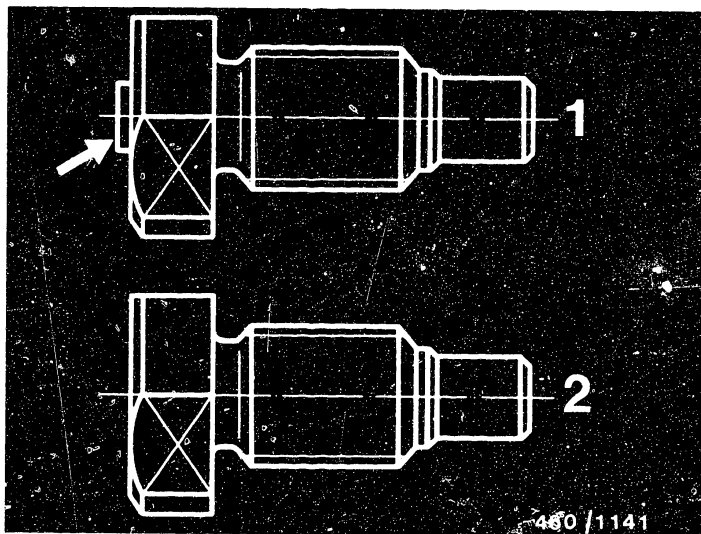
As of FD 046 (June 80) distributor-type injection pumps have been equipped with new slotted shoulder screws in which the surface of the shoulder is hardened and ground.

**G 18**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = New slotted shoulder screw

2 = Old slotted shoulder screw

To distinguish it from the old version, the new slotted shoulder screw has a projection or a circular embossing on the triangular section (see picture, arrow). When repairing distributor-type pumps as of FD 046 (June 80) use only new slotted shoulder screws. In the case of distributor-type pumps with an older FD, it is possible to use either the new or the old version of slotted shoulder screws, but always only in pairs.

**G 19**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..



Provisionally mount the assembled housing cover with fillister-head screws; install part-load governor as applicable.

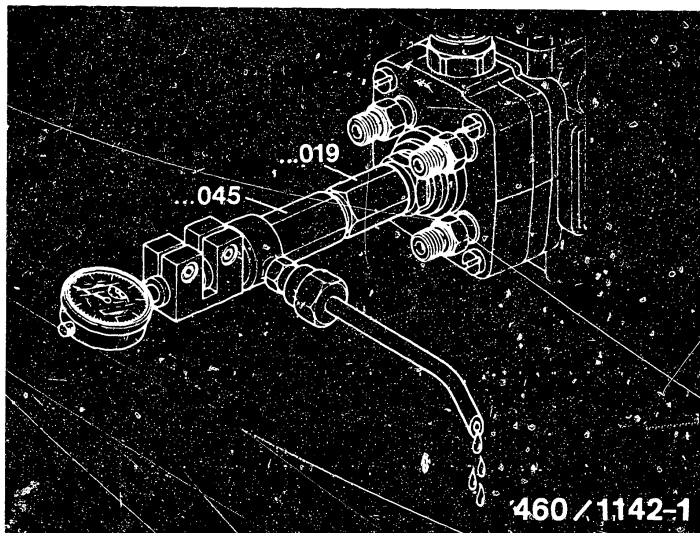
Seal threaded bore M 12 x 1.5 in housing cover with plug.

**G20**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





Screw prestroke measuring device (1 688 130 045) with appropriate extension (1 683 458 019) and dial indicator 1 687 233 012 into central screw plug. With the distributor-pump plunger in the BDC position, preload the dial indicator by 4 mm.

Remove distributor-type injection pump from clamping support and mount on clamping bracket of injection-pump test bench.

Note:

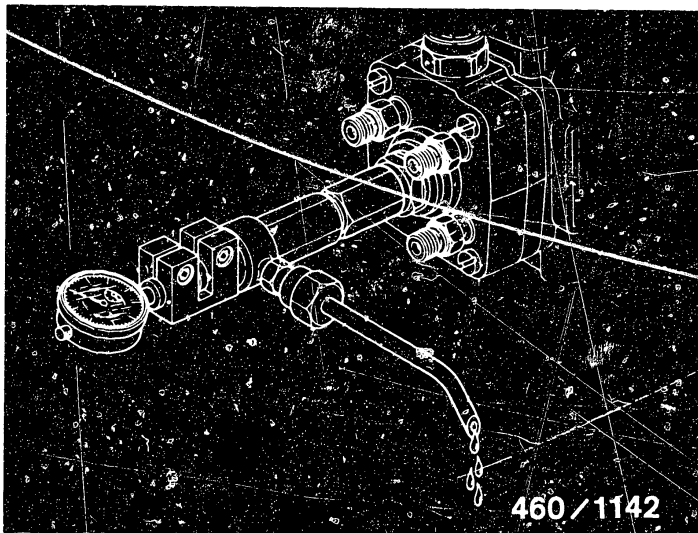
Do not pivot distributor-type pump into horizontal position until prestroke measuring device has been mounted, since otherwise there is the danger of the pre-stroke plate and rollers dropping out. Mount the drive coupling.

**G21**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..

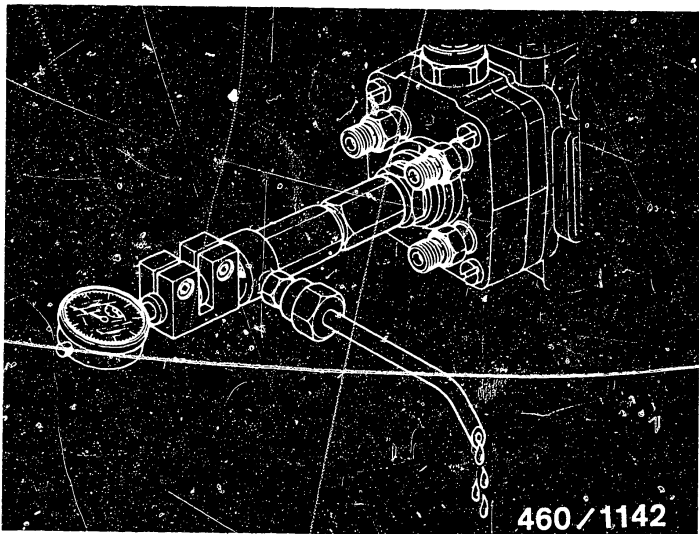




Mount the distributor-type injection pump on the test bench so that the coupling is under tensile stress. That means, mount the drive coupling of the distributor-type pump in zero-play coupling of test bench. Loosen fastening screw of clamping bracket and pull bracket with pump against the drive. At the same time tighten the fastening screw.

Connect the calibrating-oil inlet hose. Connect solenoid-operated valve (pulling electromagnet) to power supply 12/24 V (0 V for pushing electromagnet valve). Switch on injection-pump test bench and set 0.2 bar inlet pressure. Turn distributor-pump plunger to BDC position and set dial indicator to "0" (calibrating oil escapes from the overflow pipe of the measuring device).





Slowly turn drive shaft in direction of rotation until the start of delivery is reached.

Start of delivery is reached when 1 drop per second escapes from the overflow pipe (see picture, arrow).

To measure more accurately, measure drops over several seconds, e.g. 15 drops in 15 seconds.

Now read off dial indicator and compare with the specification for "prestroke setting" given in the test-specification sheet.

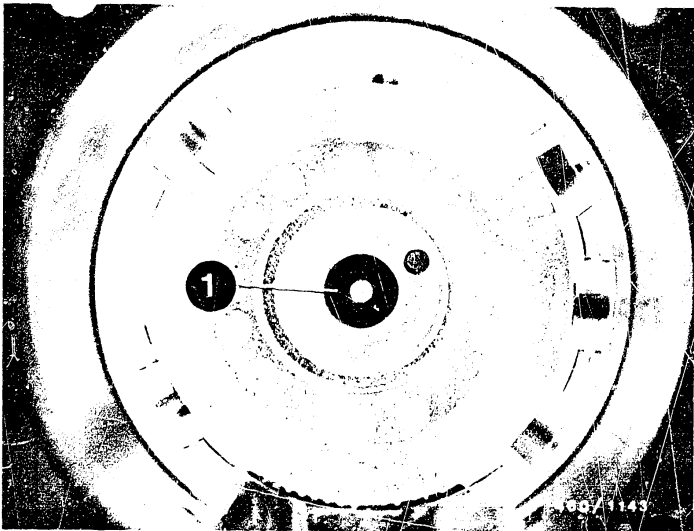
If the prestroke setting is correct, proceed to Coordinate H6.

**G23**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







1 = Shim

Rectify the error by appropriate shim under the base of the plunger.

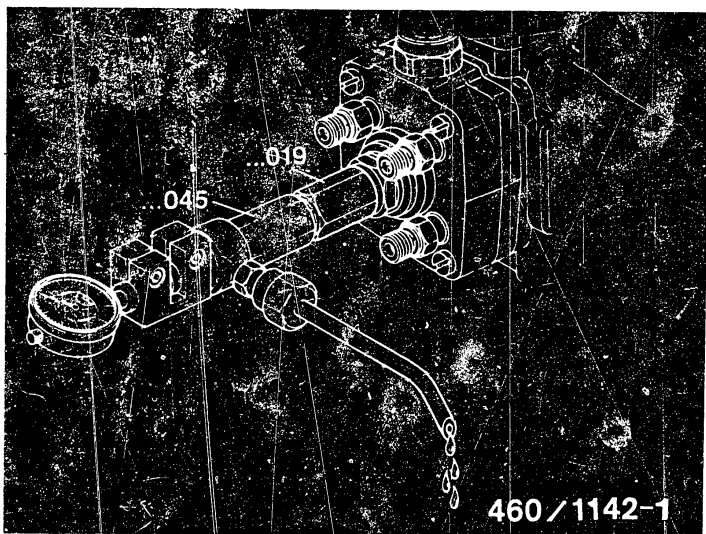
To do this, remove distributor-type injection pump from test bench, mount in clamping support and remove housing cover and hydraulic head.

If the prestroke is too great, use thicker shim; if it is too small, use thinner shim. If the choice is between 2 thicknesses of shim, choose the thicker shim. Re-mount hydraulic head and housing cover and measure prestroke as a check.

**G24**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Screw prestroke measuring device (1 688 130 045) with appropriate extension (1 683 458 019) and dial indicator 1 687 233 012 into central screw plug. With the distributor-pump plunger in the BDC position, preload the dial indicator by 4 mm.

Remove distributor-type injection pump from clamping support and mount on clamping bracket of injection-pump test bench.

Note:

Do not pivot distributor-type pump into horizontal position until prestroke measuring device has been mounted, since otherwise there is the danger of the prestroke plate and rollers dropping out.

Mount drive coupling free of play (under tension).

**H1**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



Connect the calibrating-oil inlet hose.  
Connect solenoid-operated valve (pulling electromagnet) to power supply 12/24 V (0 V for pushing electromagnet valve). Switch on injection-pump test bench and set 0.2 bar inlet pressure.

Turn distributor-pump plunger to BDC position and set dial indicator to "0" (calibrating oil escapes from the overflow pipe of the measuring device).

Slowly turn drive shaft in direction of rotation until the start of delivery is reached.

Start of delivery is reached when 1 drop per second escapes from the overflow pipe (see picture, arrow).

To measure more accurately, measure drops over several seconds, e.g. 15 drops in 15 seconds.

Read off on dial indicator whether the specified "pre-stroke setting" given in the test-specification sheet is now obtained.

**H2**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



Setting the pointer at the setting window (for setting the pump to the engine using the "pointer method")

This method of setting is to be adopted if a plunger stroke is given on the test-specification sheet for setting the prestroke.

After the prestroke has been set, switch off the test bench. Do not remove the injection pump. Remove the cover from the setting window. Turn the drive shaft in the pump direction of rotation until the mark on the cam plate is visible. The Woodruff key groove in the drive shaft points toward the outlet which is delivering.

Slowly turn the drive shaft further until the necessary stroke according to the test-specification sheet is obtained.

In this position, bring the pointer into alignment with the mark on the cam plate.

Turn back the drive shaft and check the setting.

Mount the closing cover on the setting window.

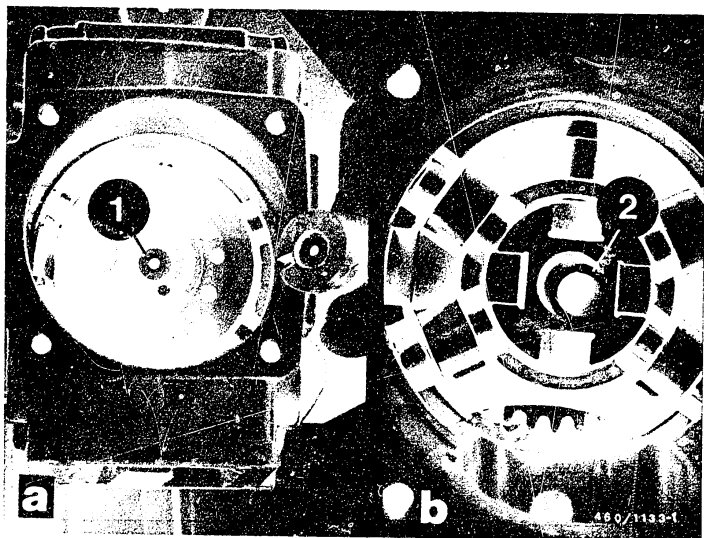
Remove the prestroke measuring device and remove the injection pump from the test bench.

**H3**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





1 = Shim

2 = Compression spring

Remove the drive coupling.

Remove the prestroke measuring device and remove the hydraulic head with distributor-pump plunger and shim. Remove the auxiliary compression spring. Check the distributor-pump plunger for freedom of movement. Unscrew housing cover. Screw out governor shaft and slotted shoulder screws.

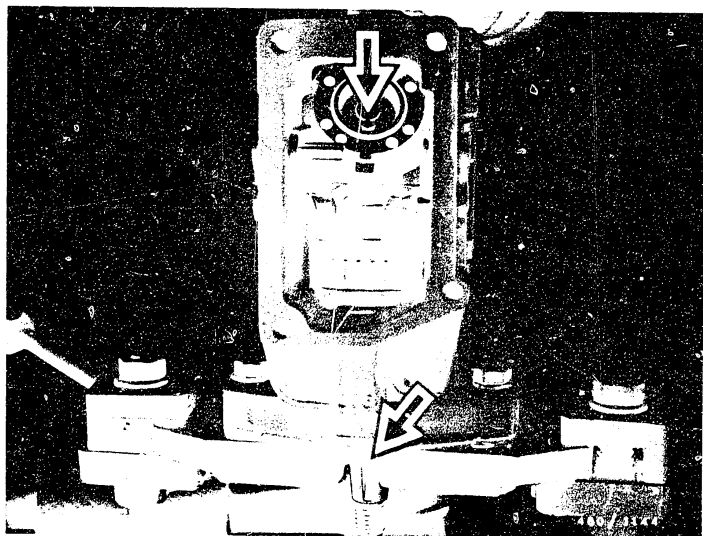
Remove part-load governor, if applicable.

Insert compression spring, if applicable, between slotted washer and cam plate.

**H4**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



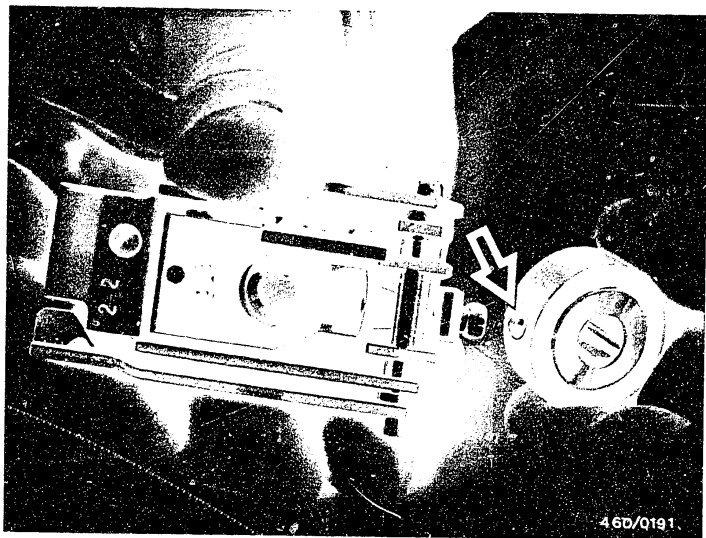


Insert the cam plate so that the driver pin (see picture, top arrow) points toward the Woodruff key groove (see picture, bottom arrow) of the drive shaft.

**H5**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





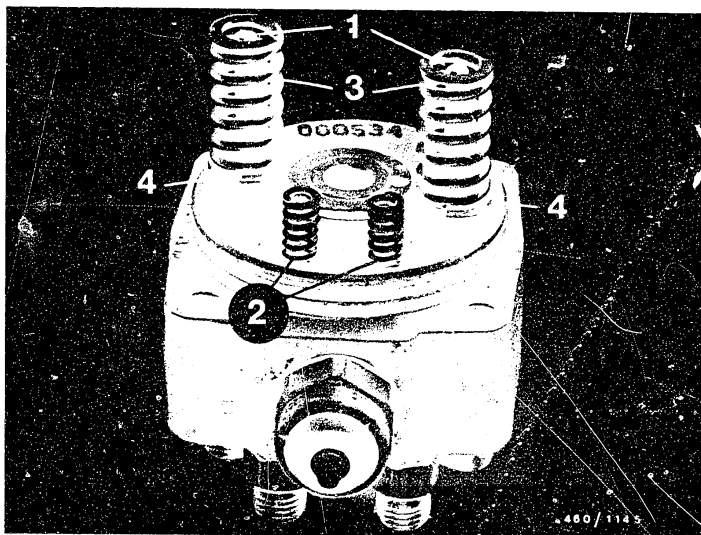
Insert ball stud of fulcrum-lever assembly into control collar bore (see picture, arrow).

If seating is not secure or if ball stud sticks, replace fulcrum-lever assembly or hydraulic head, as the case may be.

**H6**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Guide pins
- 2 = Compression springs
- 3 = Compression springs
- 4 = Shim ring

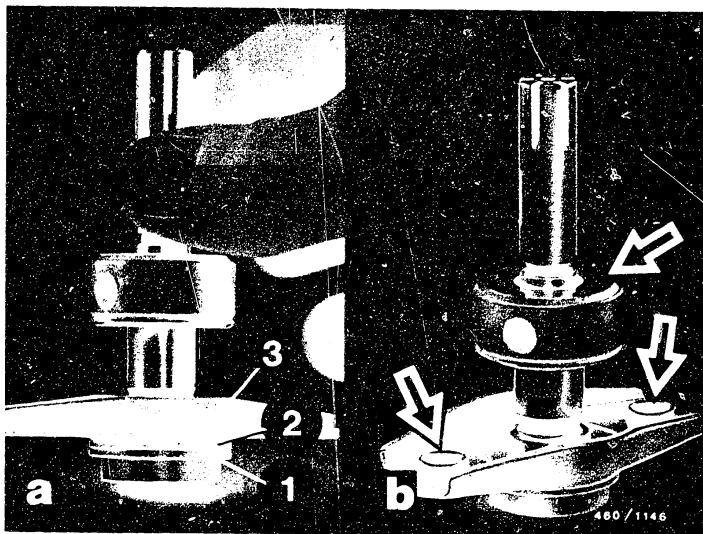
Insert guide pins, correctly dimensioned shim ring (dimension KF) and spring seat with grease in hydraulic head. "Stick" compression springs (small) in hydraulic head with grease.  
Position compression springs (large) on guide pins.

**H7**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







- 1 = Shim
- 2 = Slotted washer
- 3 = Spring seat

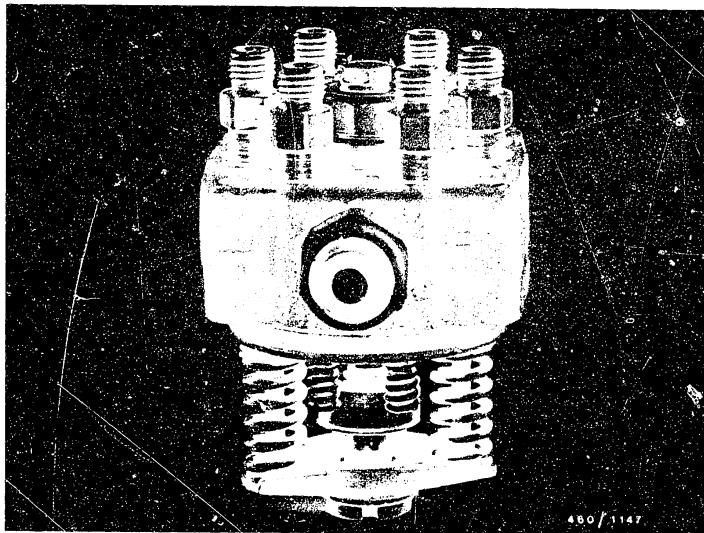
Mount shim, slotted washer and spring seat (spring guides point upward, see picture b, bottom arrows) on distributor-pump plunger.

Slip control collar onto distributor-pump plunger so that the ground section points upward (see picture b, top arrow).

**H8**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..



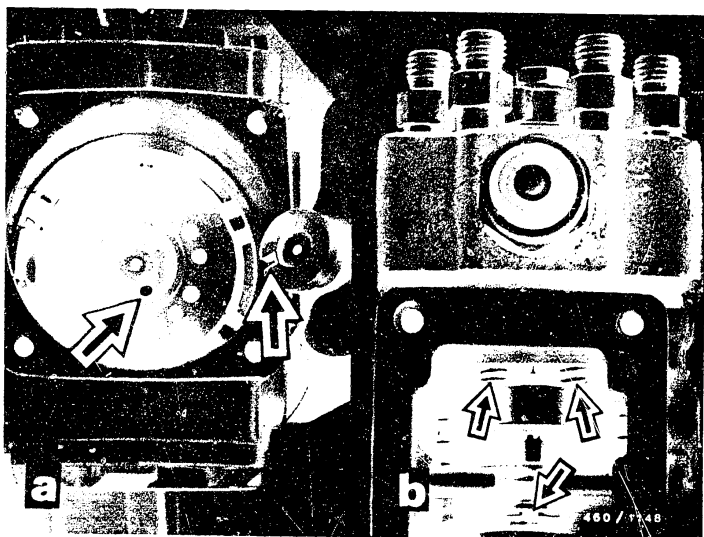


Place distributor-pump plunger assembly with correctly dimensioned shim on preassembled hydraulic head.

**H9**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



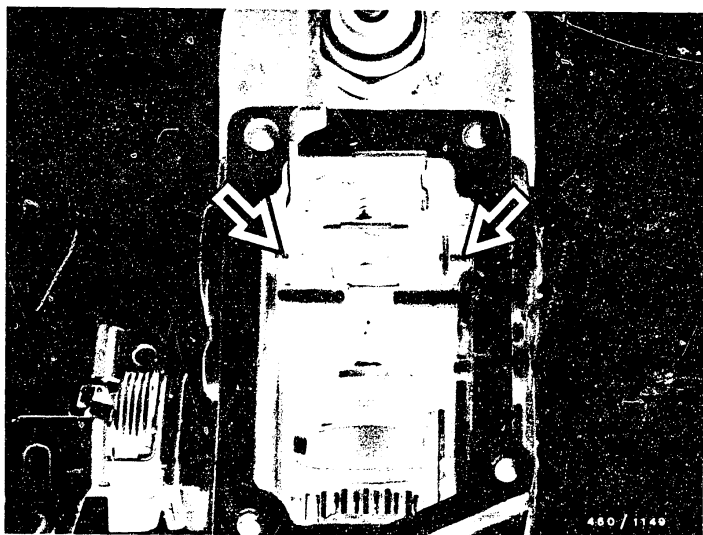


Driver pin of cam plate points toward housing cover. Recess in plunger base likewise points toward housing cover (see picture a, arrows). Insert hydraulic head assembly with distributor-pump plunger into housing so that the driver pin of the cam plate comes into the recess of the plunger base (see picture b, bottom arrow). Compression springs point to fulcrum-lever assembly (see picture b, top arrows).

**H 10**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Put in fastening screws of hydraulic head. Do not tighten (are needed only as a guide for the next operation).

Insert ball stud of fulcrum-lever assembly into control collar. Pay attention to compression springs (do not jam).

Screw fulcrum-lever assembly with slotted shoulder screws (see picture, arrows) and flat seal ring into housing. Now secure hydraulic head with fillister-head screws. Tightening torque:

Fillister-head hexagon-socket-head

cap screw 7 ... 10 Nm

Torx screw 10 ... 14 Nm

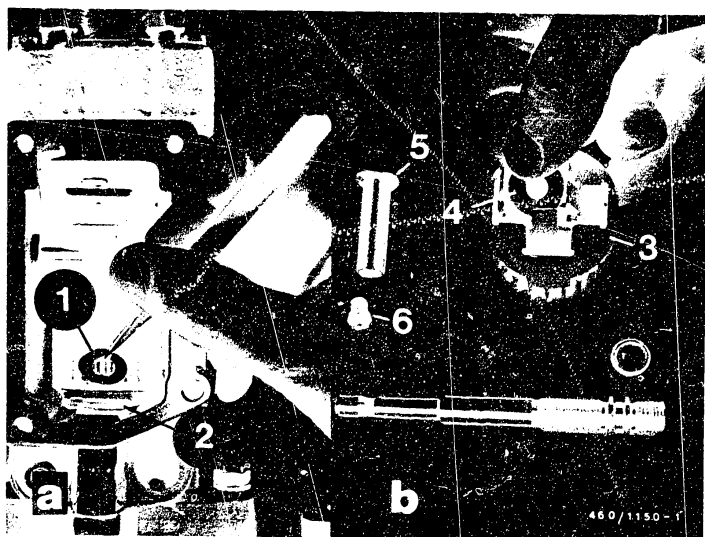
Mount support plate.

**H11**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





- |                        |                    |
|------------------------|--------------------|
| 1 = Supporting plate   | 4 = Shim ring      |
| 2 = Shim plate         | 5 = Sliding sleeve |
| 3 = Flyweight assembly | 6 = Plug           |

#### 11.19 Installing the mechanical governor

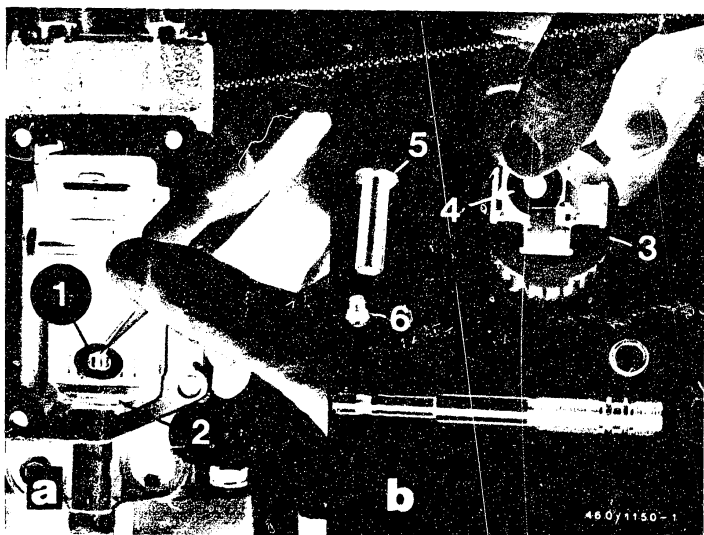
When assembling the distributor-type injection pump, make sure that the correct shim ring (see picture, item 4) with outside diameter 17 mm and bore diameter 6.5 mm is installed between sliding sleeve and flyweights.

To prevent confusion with the supporting plate (item 1) which also has an outside diameter of 17 mm, but a bore diameter of 8.5 mm, distributor-type pumps as of FD 726 have been given a supporting plate with outside diameter 20 mm.

**H12**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Supporting plate  
 2 = Shim plate  
 3 = Flyweight assembly

4 = Shim ring  
 5 = Sliding sleeve  
 6 = Plug

If an incorrect shim ring is installed between sliding sleeve and flyweights, this may result in unsteady idling in the vehicle.

Use grease to stick shim plate and supporting plate in housing (see picture a).

Assemble flyweight assembly, consisting of: flyweights, shim ring and sliding sleeve with plug.

**Note:**

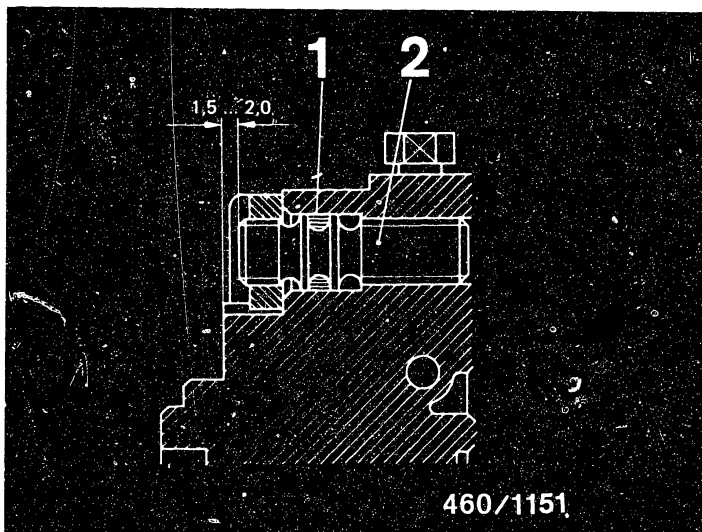
If replacing the flyweights, replace only all 4 together (parts set).

Insert complete flyweight assembly in housing.

**H 13**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





- 1 = O-ring  
2 = Governor shaft

### 11.20 Measuring the position of the governor shaft

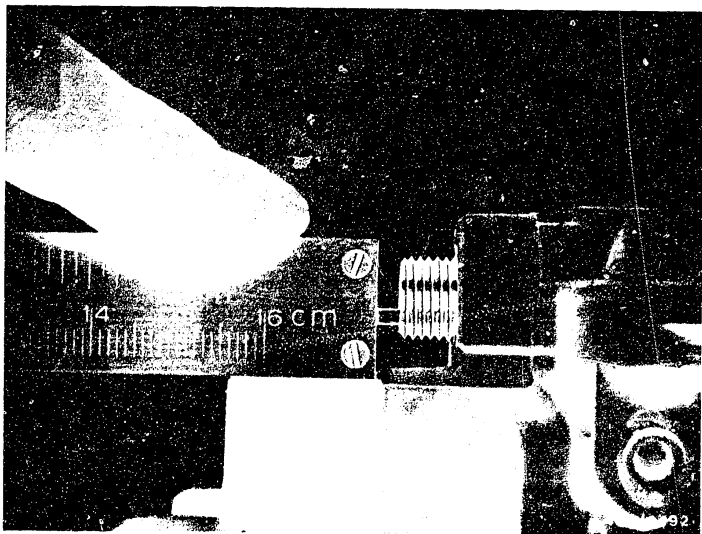
Distributor-type injection pump without "load-dependent start of delivery".

Screw governor shaft with O-ring into housing until a dimension of 1.5 ... 2.0 mm, measured from flange face to end face of governor shaft, is obtained (see picture).

**H14**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Measuring the position of the governor shaft

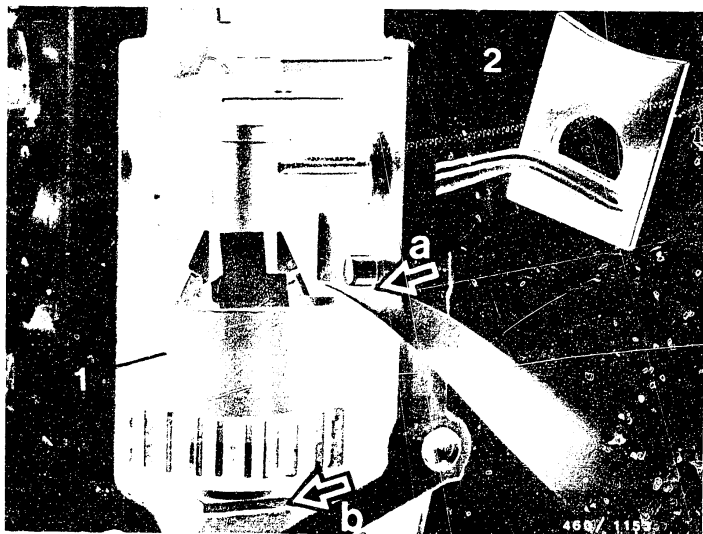
Distributor-type injection pump with "load-dependent start of delivery" (see test-specification sheet Sec. 1.7). Screw governor shaft with O-ring into housing until approx. 3.0 mm, measured from flange face to end face of governor shaft (see picture) is obtained (precise adjustment is performed when testing the distributor-type injection pump).

**H 15**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







- 1 = Governor assembly  
2 = Shim plate

### 11.21 Adjusting the axial play (with and without groove on stop pin)

Measure the axial play of the governor assembly with a feeler gauge (see picture, arrow a).

Setting dimension 0.25 ... 0.45 mm

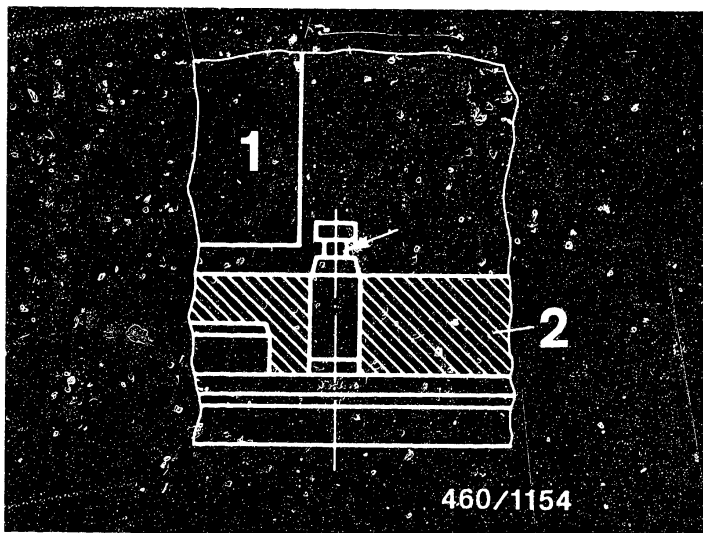
Checking dimension max. 0.65 mm

Before checking the axial play, be sure to turn over the governor assembly. This may increase the axial play. The checking dimension is then max. 0.65 mm.

**H 16**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Governor assembly      2 = Injection-pump housing

Note 1:

When replacing an injection-pump housing or a governor assembly, only governor assemblies with bronze bearing bushing may be installed in housings whose stop pin does not exhibit a groove (see picture, arrow).

**H17**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



Note 2:

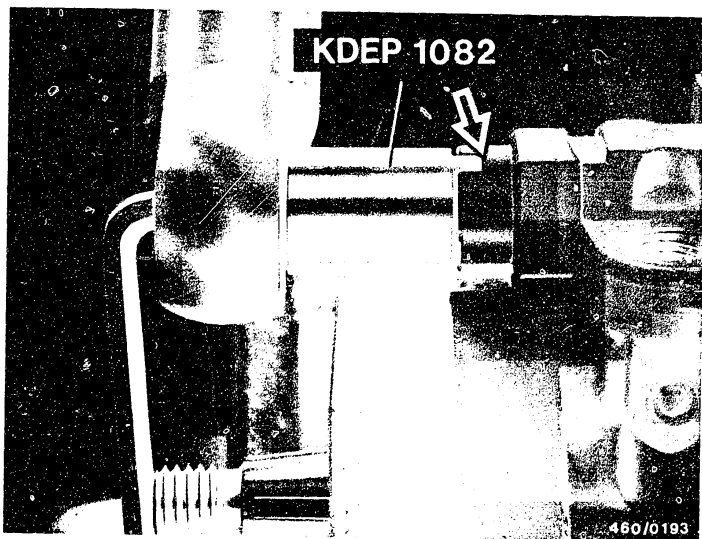
When checking field pumps (unrepaired injection pumps) the governor assembly also performs its task if it does not stick on the stop pin when turned over. A play of min. 0.1 mm is permissible.

If the axial play is greater than 0.65 mm, this likewise has no influence on the operation of the pump and is not to be classed as a fault.

**H 18**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Place distributor-type injection pump in a horizontal position.

Lock the governor shaft with slotted round nut/hexagon nut.

Tightening torque 22 ... 30 Nm.

Use setting tool KDEP 1082.

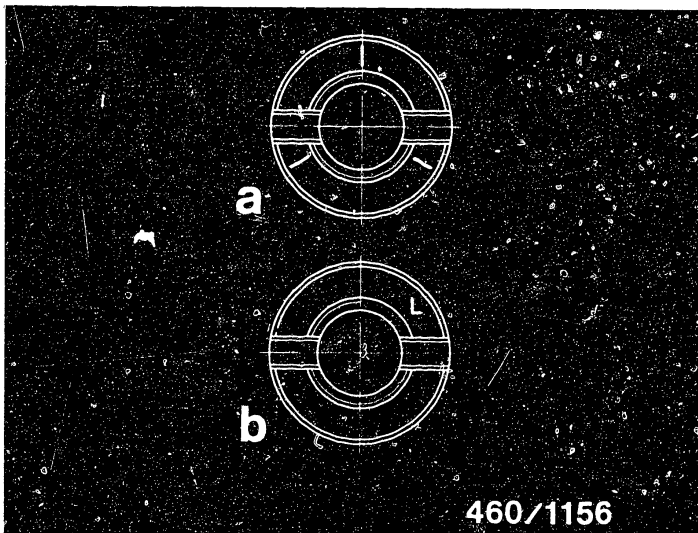
Note:

On all clockwise-rotating injection pumps with pilot 50 mm dia., as of FD 151 the thread of the governor shaft and of the pump housing has been changed from left-hand to right-hand thread.

**H 19**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



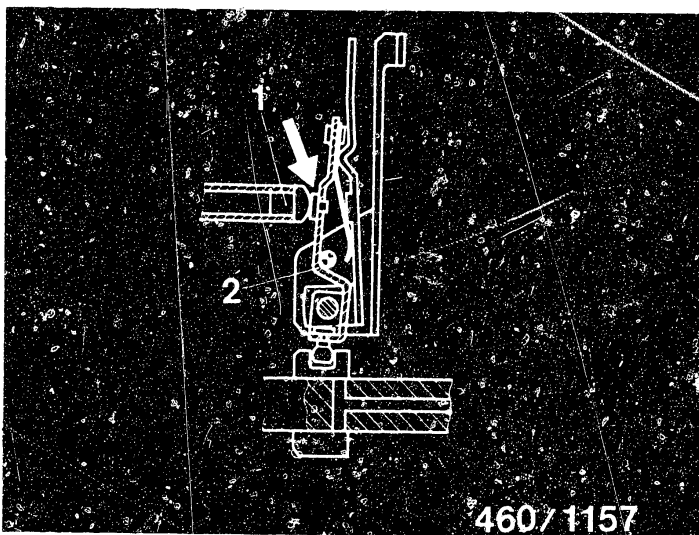


Slotted round nuts with left-hand thread may be identified in the following ways:

1. An identification groove on the circumference
2. "L" stamped onto the end faces of the slotted round nut Picture a
3. Grooves stamped into the end faces of the slotted round nut Picture b

Slotted round nuts with left-hand thread always have a yellow surface (right-hand thread white surface) even in conjunction with one of the aforementioned identification features.





- 1 = Plug  
2 = Starting lever

### 11.22 Establishing dimension "MS" (sleeve starting travel)

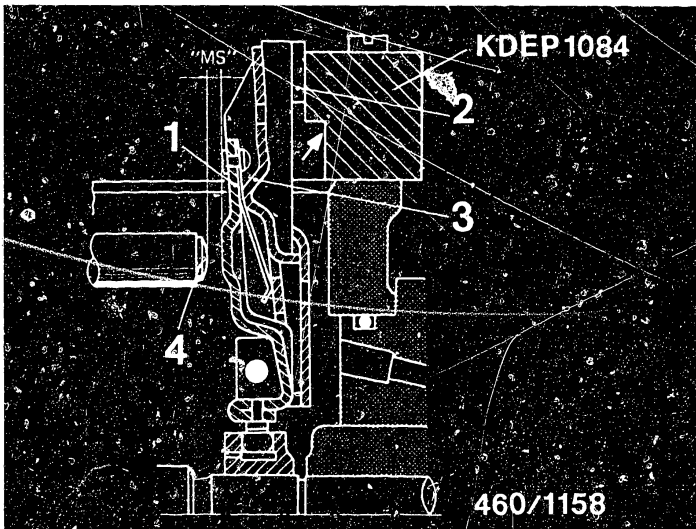
When setting dimension "MS", pay particular attention to the correct combination of starting lever and plug. The decisive feature is the thrust stud (see picture, arrow) in the starting lever.

Permissible combinations:

Starting lever without thrust stud	Plug
	1 463 120 901
Starting lever with thrust stud	Plug
	1 463 203 904 or .. 905

If these combinations are ignored, there is increased wear at the point of contact between plug and starting lever.





- |                      |                      |
|----------------------|----------------------|
| 1 = Starting lever   | 3 = Tensioning lever |
| 2 = Correction lever | 4 = Plug             |

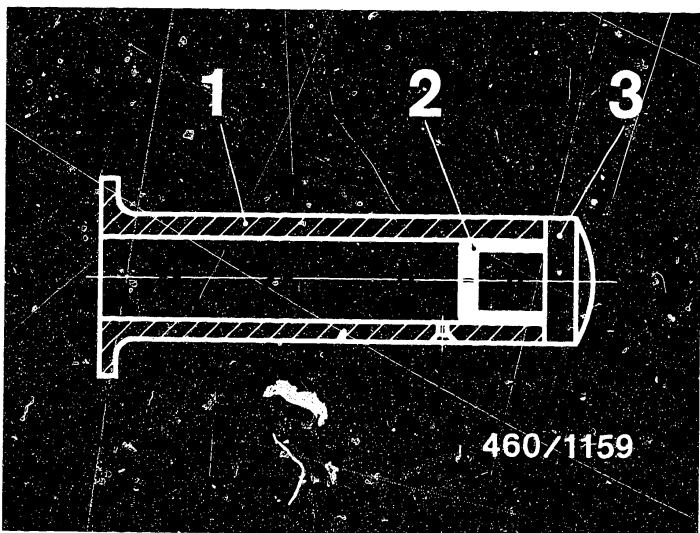
The dimension "MS" is the dimension between plug and the starting lever which is in contact with the tensioning lever.

Mount spacer KDEP 1084 on pump housing using fillister-head screws (note the recess, see picture, arrow).

Correction lever is up against shim ring.  
Press tensioning lever against stop pin.

Using a feeler gauge, measure dimension "MS" and compare with specification in test-specification sheet.





460/1159

- 1 = Sliding sleeve
- 2 = Rubber sealing cap
- 3 = Plug

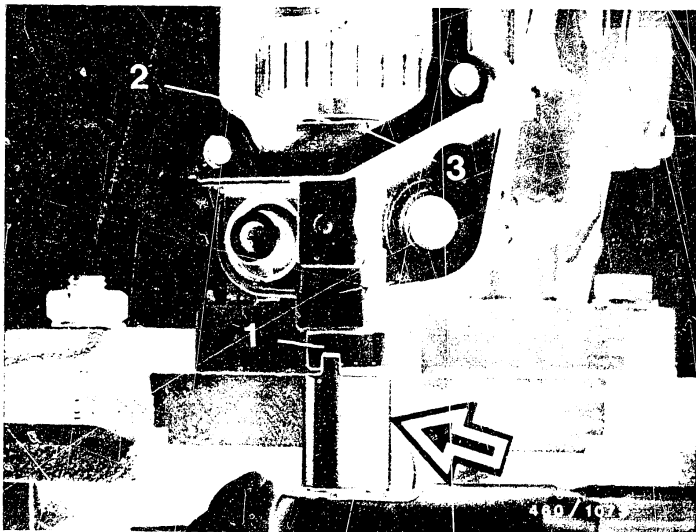
Compensate for difference by means of corresponding plug in sliding sleeve.  
To do this, it is necessary again to remove the complete governor assembly with sliding sleeve.

**H23**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







- 1 = Slotted round nut
- 2 = Supporting plate
- 3 = Shim plate

### Removing the governor shaft

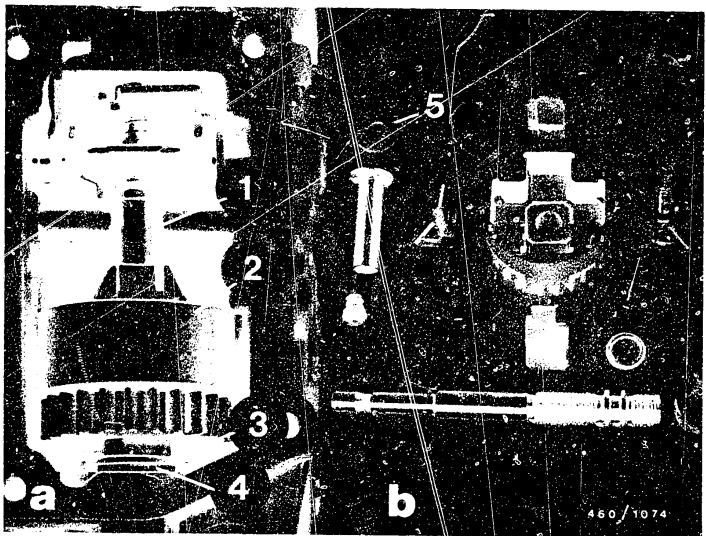
In the case of slotted round nuts with identification groove on the circumference, the governor shaft and slotted round nut have a left-hand thread.

Place the distributor-type injection pump in a vertical position.

Using setting tool KDEP 1082 (see picture, arrow) loosen slotted round nut. Pay attention to supporting plate and shim plate.

Note: In the case of all clockwise-rotating injection pumps with pilot 50 mm dia., as of FD 151 the thread of the governor shaft and of the pump housing has been changed from left-hand to right-hand thread. The previously used slotted round nut has been replaced by a hexagon nut and plain washer.





- 1 = Sliding sleeve
- 2 = Governor assembly
- 3 = Supporting plate
- 4 = Shim plate
- 5 = Shim ring

Removing the governor assembly

Lift out the governor assembly with flyweights and sliding sleeve.

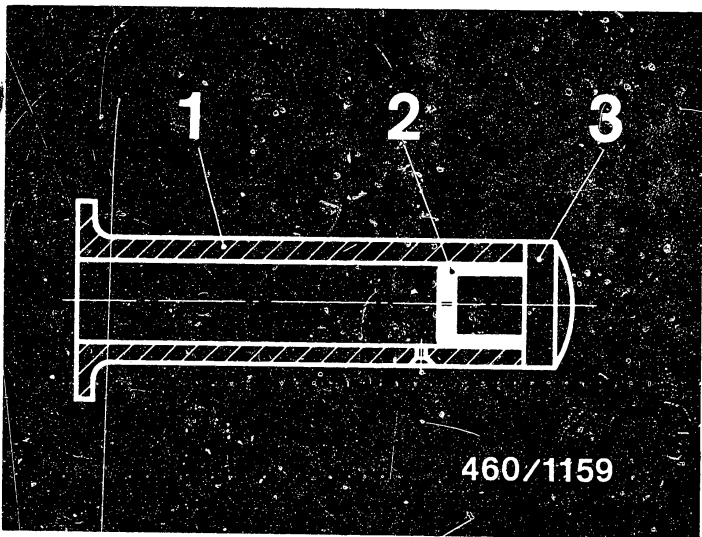
Remove supporting plate and shim plate.

When dismantling the governor assembly, pay particular attention to shim ring under sliding sleeve (do not lose).

**J1**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Sliding sleeve
- 2 = Rubber sealing cap
- 3 = Plug

Note:

As of FD 927 some distributor-type pumps have a new form of mounting for the plug on the sliding sleeve.

The plug is secured in the sliding sleeve by means of a rubber sealing cap. The sliding sleeve exhibits a restriction bore with countersink (see picture). If repairing, even in the case of pumps before FD 927, use the type of plug mounting as per service-parts list.

If so specified by the service-parts list, it is possible to install a rubber sealing cap instead of a tab washer.

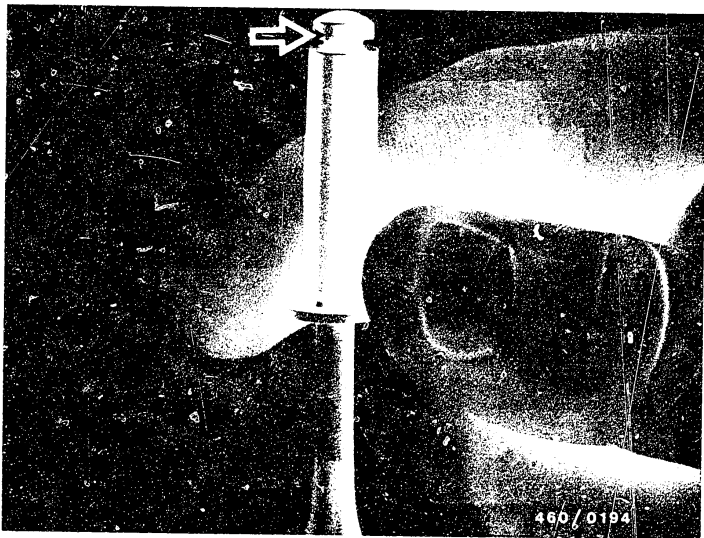
It is not necessary to change the sliding sleeve, even if the restriction bore does not exhibit a countersink.

**J2**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..





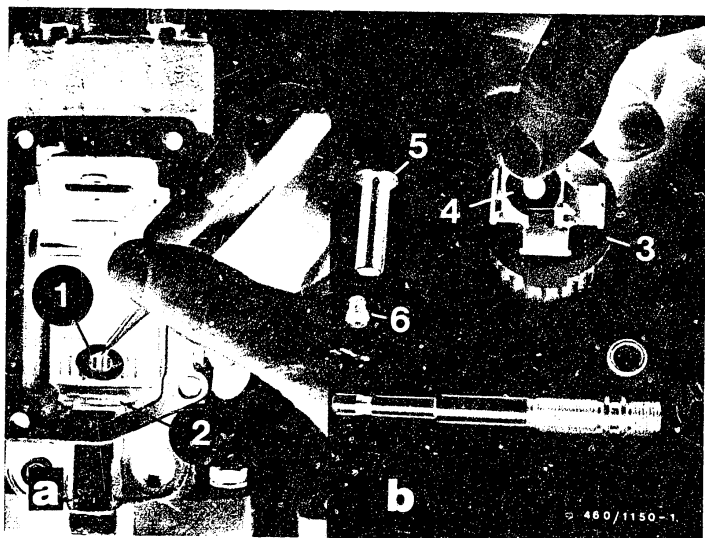
Press out plug (see picture, arrow) using mandrel. When pressing in the appropriate plug, pay attention to tab washer or rubber sealing cap.

Re-install governor assembly and check dimension "MS" again.

**J3**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Supporting plate  
 2 = Shim plate  
 3 = Governor assembly

4 = Shim ring  
 5 = Sliding sleeve  
 6 = Plug

Installing the mechanical governor:

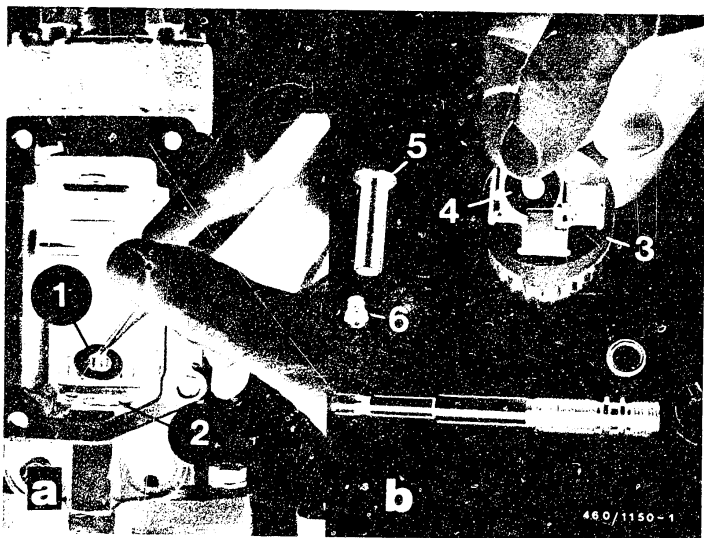
When assembling the distributor-type injection pump, make sure that the correct shim ring (see picture, item 4) with outside diameter 17 mm and bore diameter 6.5 mm is installed between sliding sleeve and fly-weights.

To prevent confusion with the supporting plate (item 1) which also has an outside diameter of 17 mm, but a bore diameter of 8.5 mm, distributor-type pumps as of FD 726 have been given a supporting plate with outside diameter 20 mm.

**J4**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





- 1 = Supporting plate
- 2 = Shim plate
- 3 = Governor assembly

- 4 = Shim ring
- 5 = Sliding sleeve
- 6 = Plug

If an incorrect shim ring is installed between sliding sleeve and flyweights, this may result in unsteady idling in the vehicle.

Use grease to stick shim plate and supporting plate in housing (see picture a).

Assemble governor assembly, consisting of: flyweights, shim ring and sliding sleeve with plug.

Note:

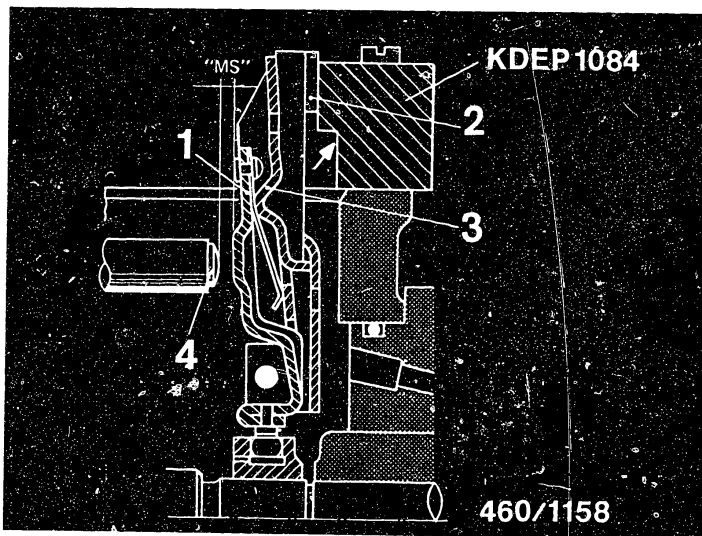
If replacing the flyweights, replace only all 4 together (parts set).

Insert complete governor assembly in housing.

**J5**

Assembling the fuel-injection pump \_\_\_\_\_  
 Distributor-type pump 0 460 4..





1 = Starting lever  
2 = Correction lever

3 = Tensioning lever  
4 = Plug

Mount spacer KDEP 1084 on pump housing using fillister-head screws (note recess, see picture, arrow).

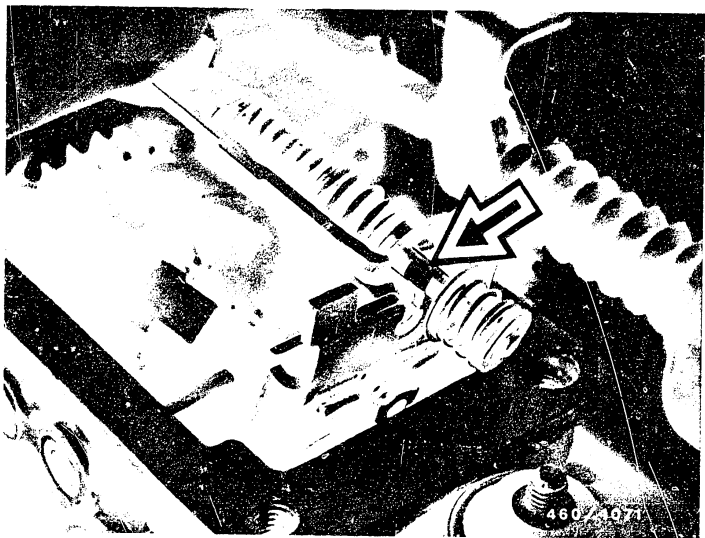
Correction lever is up against spacer.  
Press tensioning lever against stop pin.  
Using feeler gauge, establish dimension "MS" and compare with specification in test-specification sheet.

If dimension "MS" O.K., remove spacer KDEP 1084.

**J6**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





11.23 Installing the part-load governor (with unhooking surfaces)

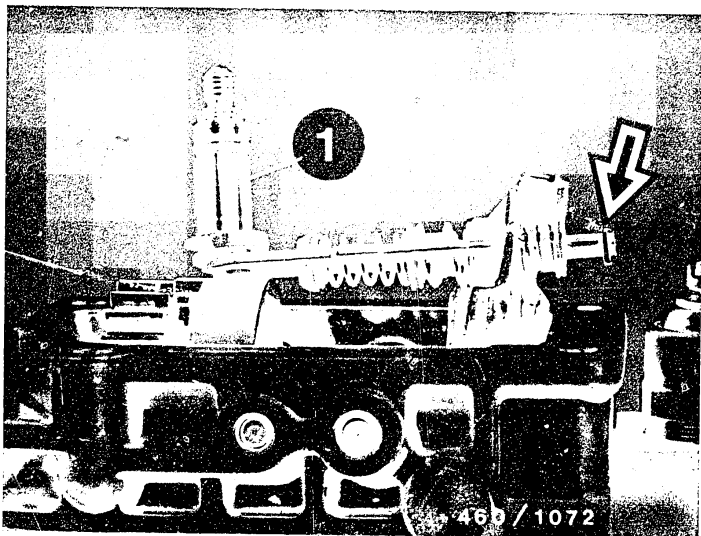
Hook the part-load governor at the machined surfaces (see picture, arrow) into the part-load governor so that the retaining pin and intermediate spring are behind the tensioning lever (see picture).

**J7**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..







1 = Control lever shaft

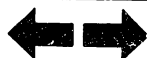
Installing the part-load governor without unhooking surfaces

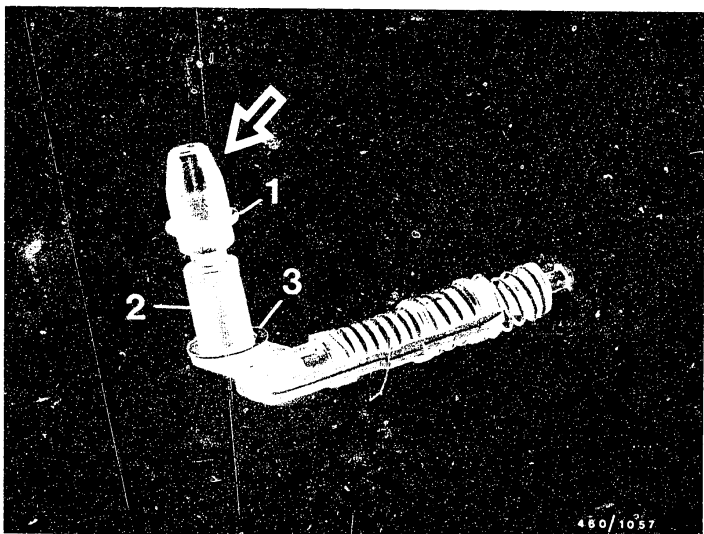
Introduce part-load governor with control lever shaft into fulcrum-lever assembly.

Slip intermediate spring and bushing onto guide pin.  
Mount retainer on guide pin (see picture, arrow).

**J8**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = O-ring    2 = Control lever shaft    3 = Shim

Mount shim and O-ring on control lever shaft of part-load governor.

Use assembly sleeve KDEP 2937 (see picture, arrow).

Insert new seal ring in housing cover.

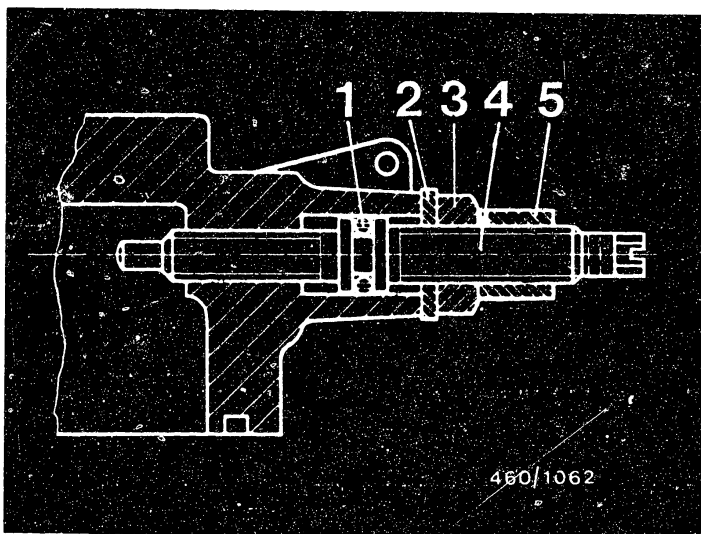
Pimples on the circumference of the seal ring prevent it from dropping out when mounting the housing cover.

Previous seal rings without pimples can be used up.

**J9**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = O-ring  
 2 = Plain washer  
 3 = Hexagon nut

4 = Threaded pin  
 5 = Retaining sleeve

Place housing cover on pump housing.

Note: Distributor-type pumps (as of 1978) have longer threaded pins as full-load stop screws which are located with an outer spacer sleeve (see picture). The previously used inner spacer sleeve is deleted.

The new spacer sleeve cannot be removed from the threaded pin. For this reason, use a new threaded pin whenever carrying out repairs.

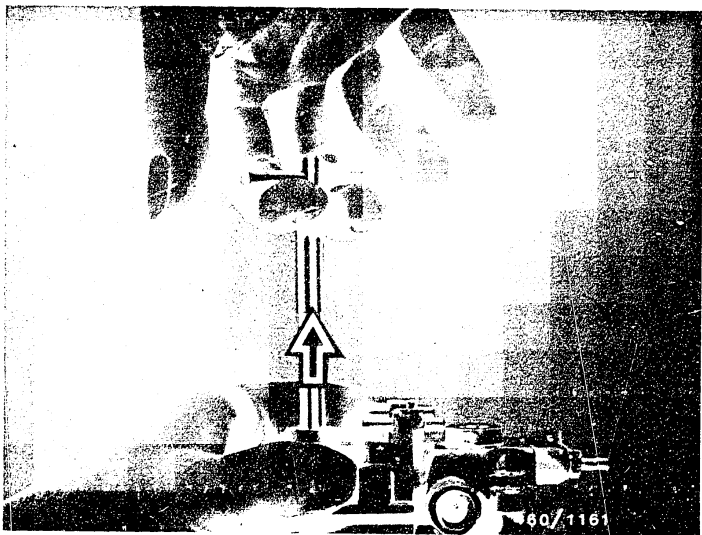
The previous threaded pins with inner spacer sleeve should no longer be used.

The outer spacer sleeve cannot be secured in place until after the pump has been set.

**J10**

Assembling the fuel-injection pump  
 Distributor-type pump 0 460 4..





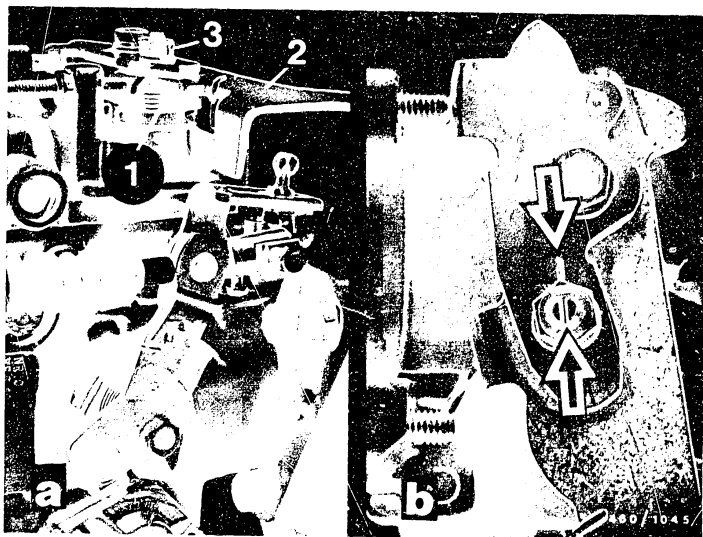
Pull part-load governor through housing cover with assembly wrench KDEP 1096 (see picture, arrow).

Secure housing cover on pump housing with fillister-head screws.

**J11**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Cylindrical helical coiled spring
- 2 = Control lever
- 3 = Hexagon nut with spring lock washer

Mount cylindrical helical coiled spring and control lever. Mount control lever on control lever shaft so that marks on control lever and control lever shaft are in alignment (see picture b, arrows).  
Screw in overflow restriction "OUT".

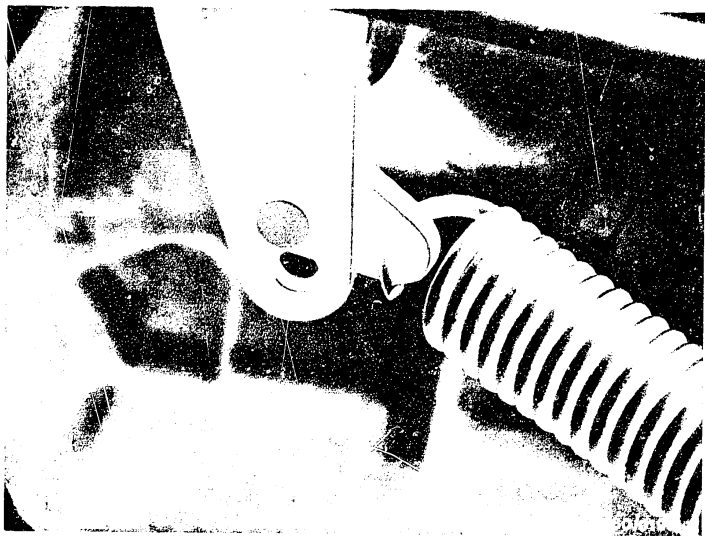
**Note:**

After repairs are finished, lubricate two-part control lever with double spring combination (if applicable) and lower stop bushing with multi-grade grease or engine oil.

**J12**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





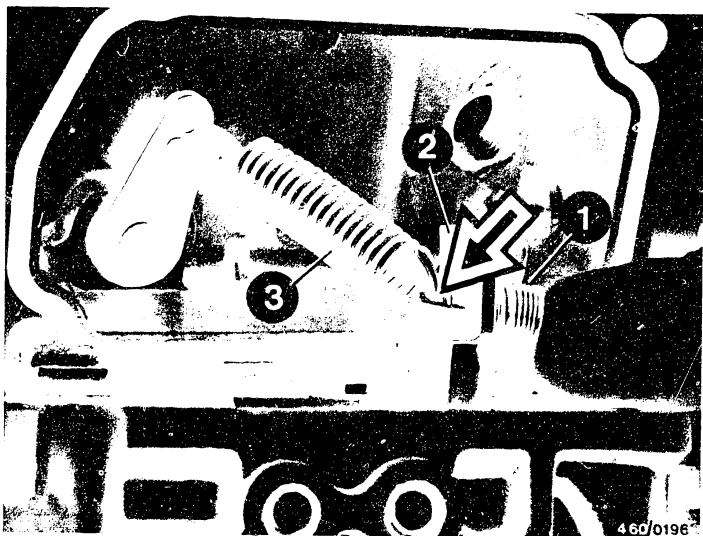
11.24 Mounting the variable-speed governor

Hook extension spring into control lever shaft so that the eye opening points downward (see picture).

**J13**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Retaining pin with compression spring
- 2 = Tensioning lever
- 3 = Extension spring

Stick retaining pin with compression springs through the hole of the tensioning lever and hook in extension spring (see picture, arrow).

Note:

Retaining pin with compression springs must be regarded as one unit and must only be exchanged together (parts set).

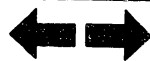
Secure housing cover with fillister-head screws.

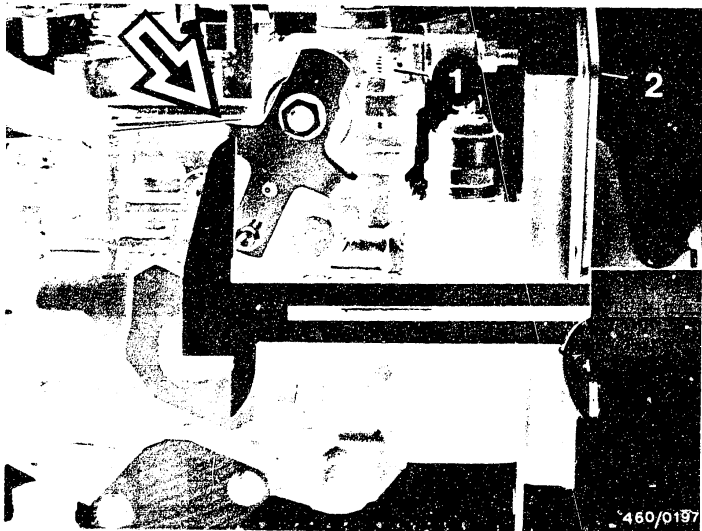
Screw in overflow restriction "OUT".

Note: After repairs are finished, lubricate two-part control lever with double spring combination (if applicable) and lower stop bushing with multi-grade grease or engine oil.

**J14**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





- 1 = Threaded stop pin  
2 = Support plate

### Adjusting the mechanical shutoff

Provisionally mount support plate on distributor-type fuel-injection pump.

Select feeler gauge having the noted dimension and place between housing cover and stop lever (see picture, arrow).

Using a caliper gauge, measure distance between support bracket and pin on stop lever.

Adjust threaded stop pin so that the adjusting travel of the pin is 21.5 ... 22.0 mm.

Lock the threaded pin.

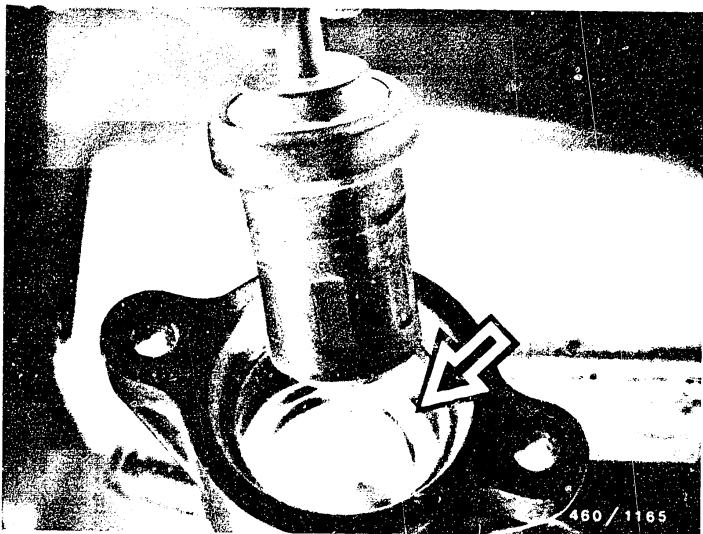
**J 15**

Assembling the fuel-injection pump

Distributor-type pump 0 460 4..







### 11.25 Mounting the temperature-controlled idle-speed increase (TLA)

Assembling the control device:

Insert O-ring (see picture, arrow) into bottom part of control device.

Pin must not be pulled out of the thermostat.

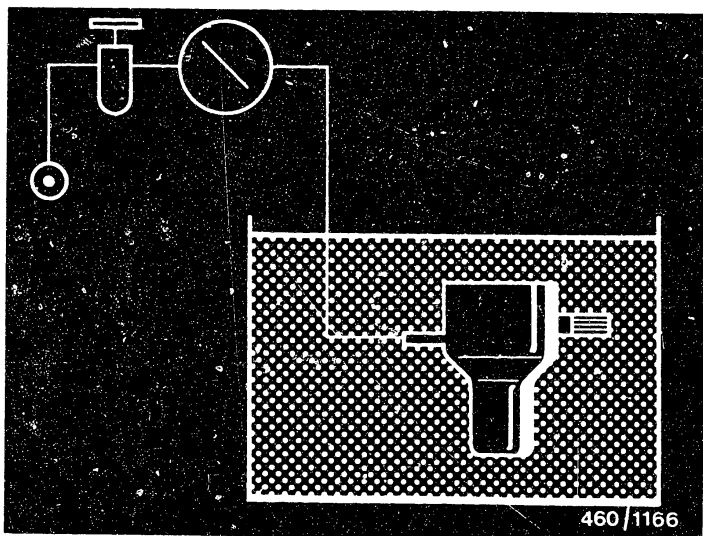
Introduce thermostat into control device.

Screw in threaded ring and tighten with pin wrench KDEP 1110.

**J16**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





Checking the bottom part of the control device  
for leaks

Connect one of the fittings for cooling water to the compressed-air supply system.

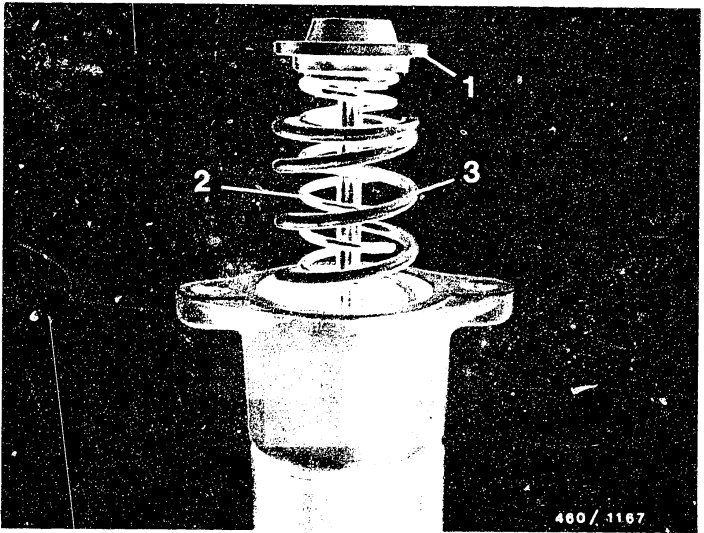
Seal the second fitting with plug KDEP 1111.

Apply a gauge pressure of 5.0 bar to the bottom part of the control device and check for leaks in oil bath (see picture).

**J17**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





1 = Spring seat

2 = Inner compression spring

3 = Outer compression spring

Insert top part of control device in assembly tool  
KDEP 1109.

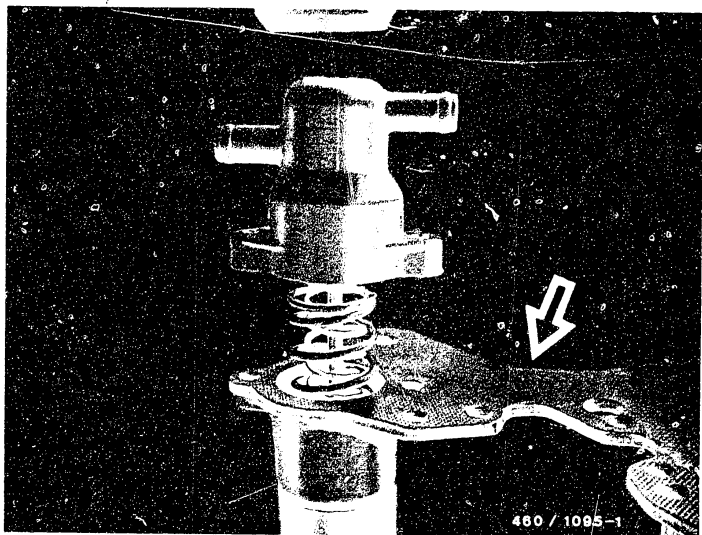
Insert both compression springs in control device.

Position spring seat with cable on compression springs.  
Introduce cable into guide bore in top part of control  
device.

**J18**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





During the following operations, pay attention to the installation position.

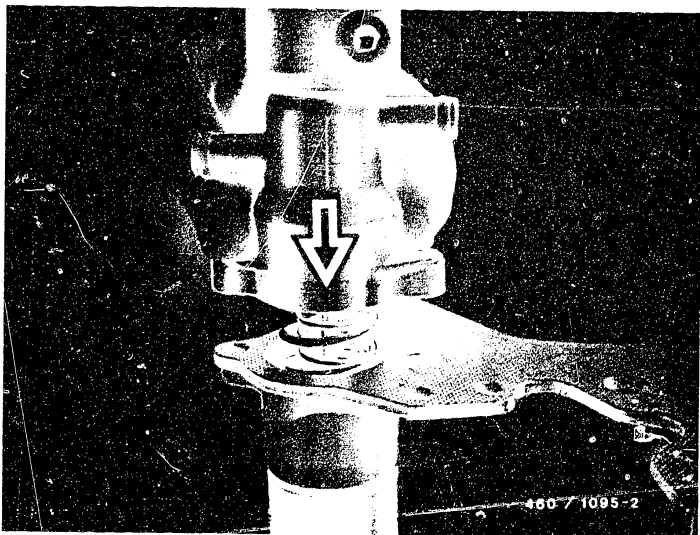
Place support plate on top part of control device (see picture, arrow).

Place bottom part assembly of control device on top part.

**J 19**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..





During the following operation, make sure that guide sleeve of wire cable and bottom part of control device are not damaged.

Carefully press bottom part of control device onto top part by means of arbor press.

Screw in fillister-head screws and tighten.

Remove complete control device from assembly tool.

Do not yet mount control device on hydraulic head.

**J20**

Assembling the fuel-injection pump  
Distributor-type pump 0 460 4..



## 12. Repairing the manifold-pressure compensator (LDA)

In the case of manifold-pressure compensators from FD 732 (12.77) to FD 141 (Jan. 81) it is only possible to replace the diaphragm since the bearing bushing of the guide pin has been bonded into the manifold-pressure compensator housing.

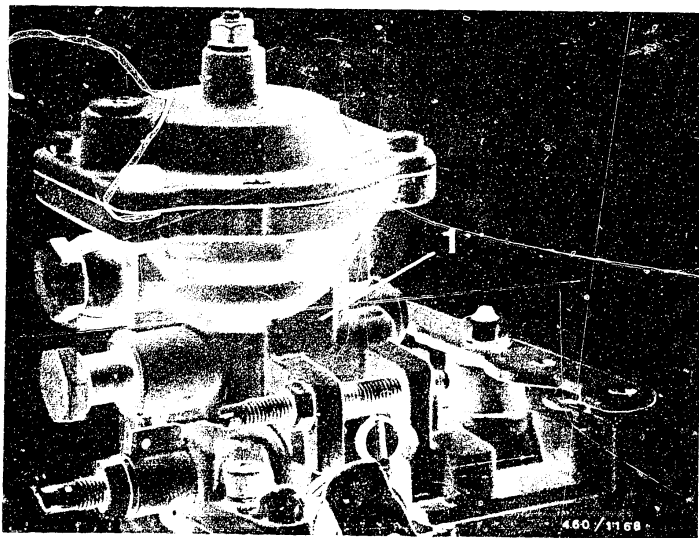
If there is damage to the manifold-pressure compensator housing or to the bearing bushing, it is necessary to replace the complete manifold-pressure compensator housing.

The above-mentioned bonding was dropped with the introduction of improved manifold-pressure compensator housings as of FD 141 (Jan. 81). A complete repair of the manifold-pressure compensator housings is thus possible.

**J21**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Manifold-pressure compensator housing

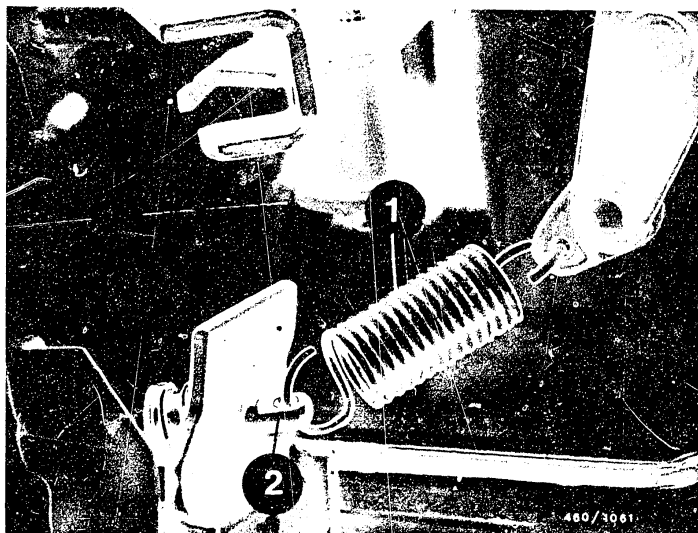
### 12.1 Dismantling the manifold-pressure compensator (LDA)

Remove inlet-union screw and overflow restriction and drain distributor-type injection pump.  
Mount distributor-type injection pump with flange and support clamp KDEP 2963 on clamping support KDEP 2919.  
Unscrew manifold-pressure compensator housing.

**J22**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Extension spring

2 = Retaining pin with compression spring

Unhook extension spring out of retaining pin.

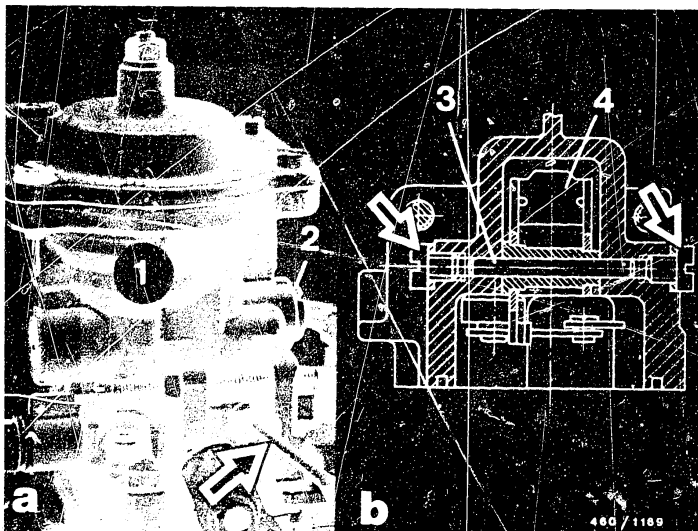
**J23**

Dismantle manifold-pressure compensator

Distributor-type pump 0 460 4..







1 = Stop housing  
2 = Screw plug

3 = Straight pin  
4 = Control lever

Provisionally re-mount manifold-pressure compensator housing on pump housing.

Remove screw plug and lateral fillister-head screws (picture b, arrows) with flat seal rings.

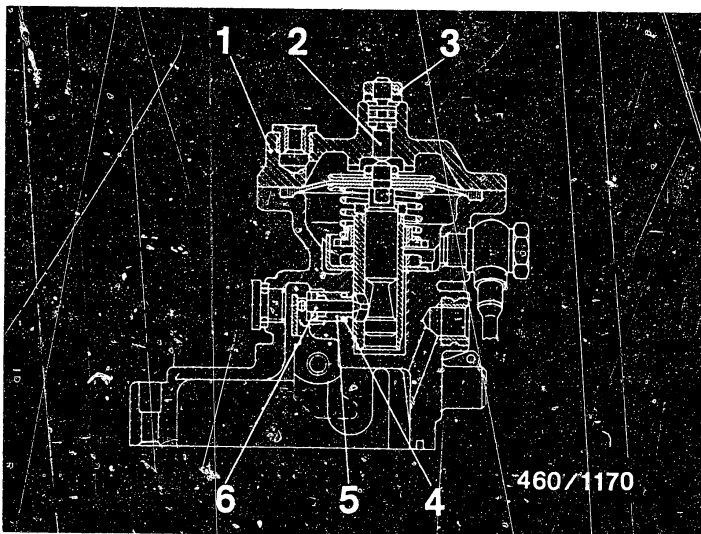
Drive out straight pin with drift (see picture a, arrow).

Control lever now drops downward; if necessary, press downward.

**J24**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Closing cover  
 2 = Threaded pin  
 3 = Hexagon nut

4 = Flat copper seal ring  
 5 = Bearing bushing

Pull guide pin out of bearing bushing with pointed or flat-nose pliers.

Note:

The flat copper seal ring cannot be removed since it is bonded into the manifold-pressure compensator housing.

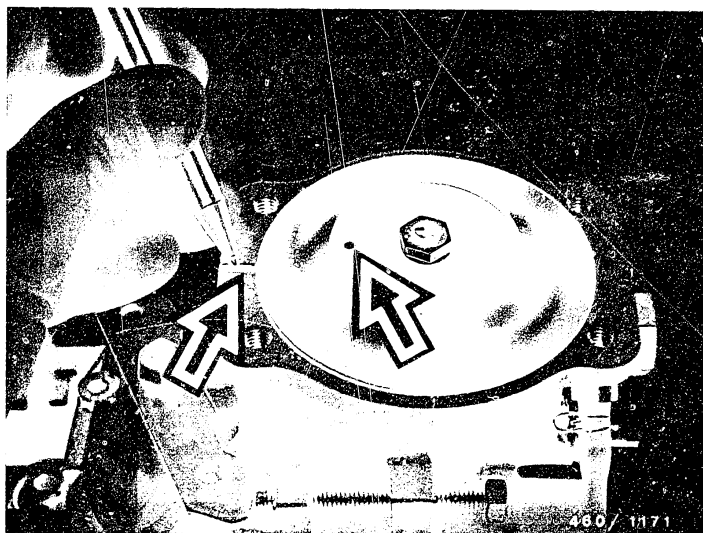
Unscrew closing cover.

Screw off hexagon nut and remove threaded pin.

**K1**

Dismantle manifold-pressure compensator  
 Distributor-type pump 0 460 4..





- 1 = Stop housing
- 2 = Plate washer

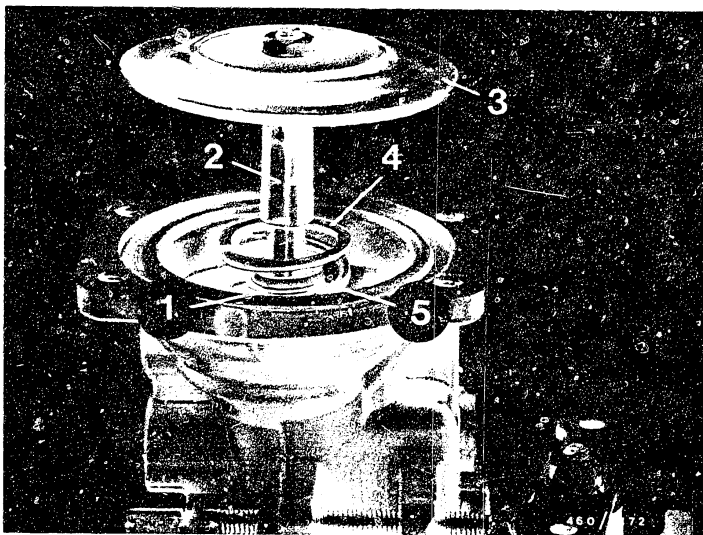
Mark position of marking on plate washer (see picture, arrow on right) by making a mark with a felt-tipped pen on the manifold-pressure compensator housing (see picture, arrow on left).

Note: Marking these parts makes it easier when later setting the manifold-pressure compensator and the injection pump (only fine setting then necessary).

**K2**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





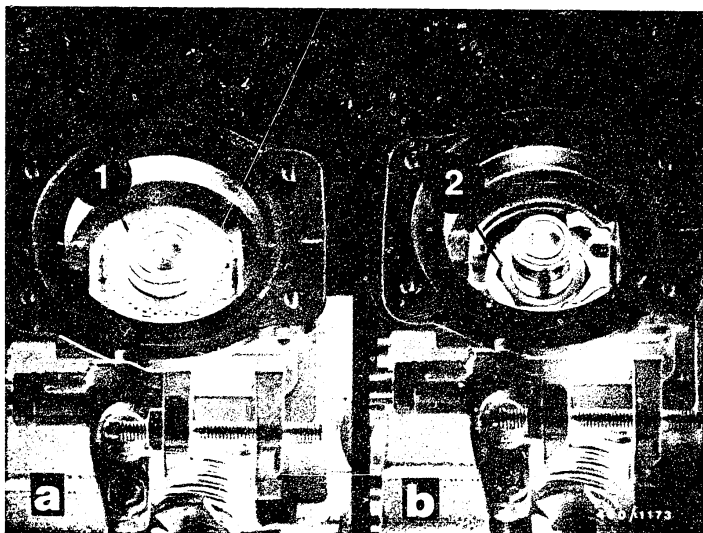
- 1 = Bearing bushing (black)
- 2 = Sliding bolt
- 3 = Diaphragm
- 4 = Compression spring
- 5 = Spacer bushing (white)

Remove diaphragm with sliding bolt out of bearing bushing. Take out compression spring and spacer bushing.

**K3**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





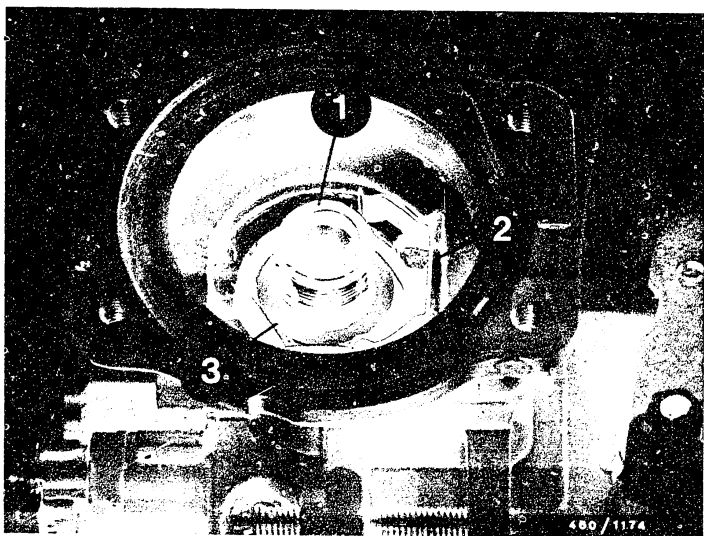
- 1 = Adjusting nut
- 2 = Hexagon nut

Screw out adjusting nut and loosen hexagon nut.

**K4**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





- 1 = Bearing bushing
- 2 = Locking piece
- 3 = Hexagon nut

Screw bearing bushing out of manifold-pressure compensator housing.

Remove locking piece.

Unscrew hexagon nut from bearing bushing.

**K5**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





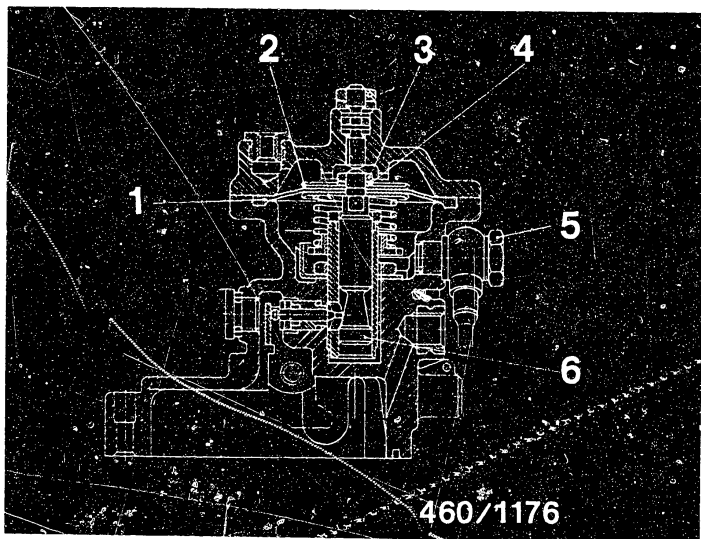
Clamp sliding bolt in clamping fixture KDEP 1102 (see picture).

Mark the position of the marking on the plate washer on the head of the sliding bolt (see picture, arrows).

**K6**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Diaphragm  
2 = Plate washers  
3 = Hexagon nut

4 = Spring washer  
5 = Bleeder screw  
6 = Sliding bolt

Loosen hexagon nut.

Remove spring washer, plate washers and diaphragm from sliding bolt.

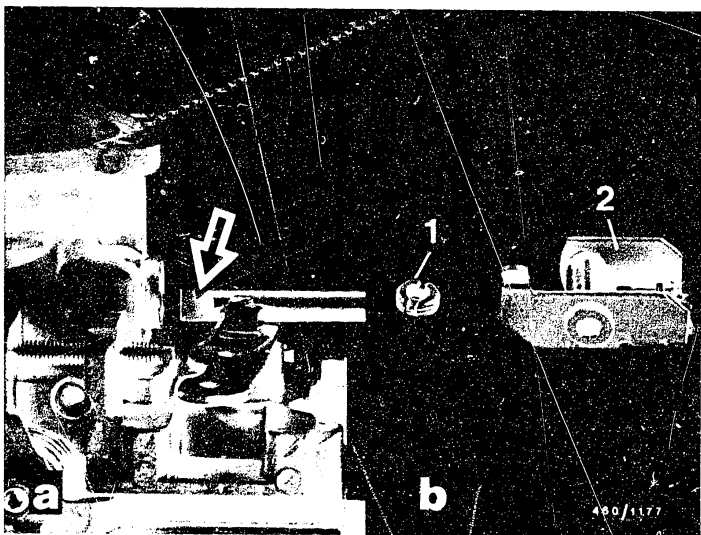
Remove bleeder screw.

**K7**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..







1 = Slotted round nut

2 = Control lever

Loosen slotted round nut with screwdriver bit KDEP 1090 (see picture a, arrow) but do not unscrew entirely.

Unscrew manifold-pressure compensator housing from pump housing.

Take control lever out of pump housing.

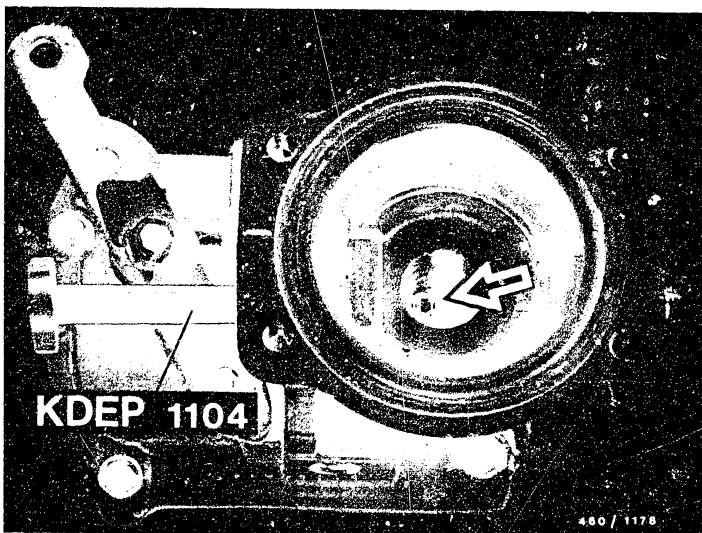
Remove slotted round nut.

**K8**

Dismantle manifold-pressure compensator

Distributor-type pump 0 460 4..





Introduce puller KDEP 1104 without sleeve into bearing bushing.  
Screw hexagon nut (see picture, arrow) onto thread of puller.

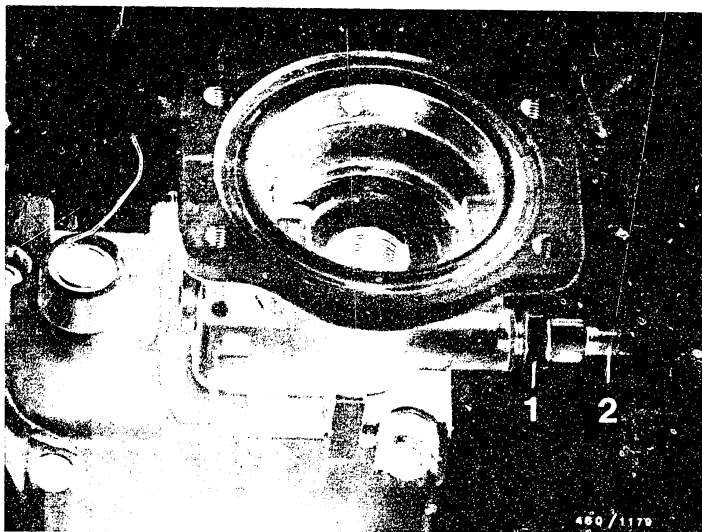
Pull bearing bushing out of manifold-pressure compensator housing.

Remove control lever, control lever shaft and stop lever, as applicable.

**K9**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..





- 1 = Hexagon nut  
2 = Threaded pin

Screw out threaded pin with hexagon nut.

Check all moving parts (sliding bolt, guide pin, control lever and diaphragm) for wear.

Replace seals and O-rings.

**K10**

Dismantle manifold-pressure compensator  
Distributor-type pump 0 460 4..



## 12.2 Cleaning the parts

Wash out the parts in low-inflammability commercially available cleaning agent, e.g. Chlorothene NU.  
Then blow off with compressed air.

### Observe the following safety regulations

Decree on working with inflammable liquids (Vbf)  
issued by the Federal Ministry of Labor (BmA).

Safety rules for handling chlorinated hydrocarbons  
for the workshop ZH 1 / 222  
for the employee ZH 1 / 119  
issued by the Central Association for German Employers'  
Liability Insurance Associations (Central Association  
for Accident Prevention and Industrial Medicine)  
Langwartweg 103, 5300 Bonn 5.

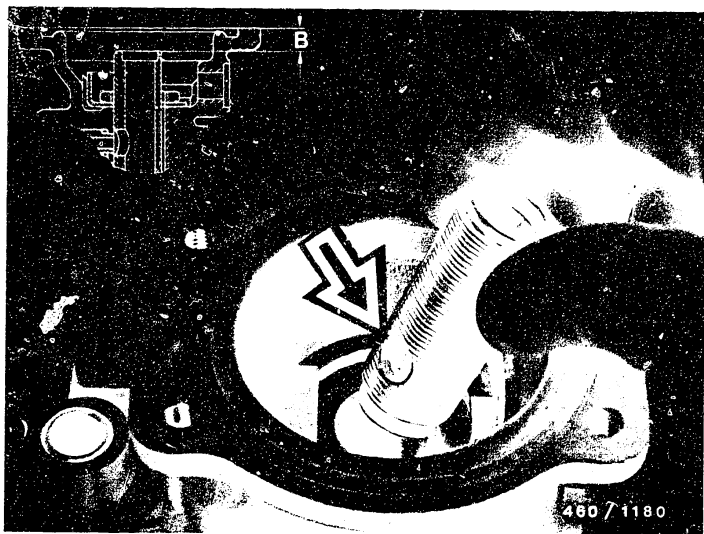
In countries outside the Federal Republic of Germany,  
observe the corresponding local regulations.

**K11**

Cleaning the parts - safety regulations

Distributor-type pump 0 460 4..





### 12.3 Assembling the manifold-pressure compensator

#### 12.3.1 Assembling the manifold-pressure compensator housing

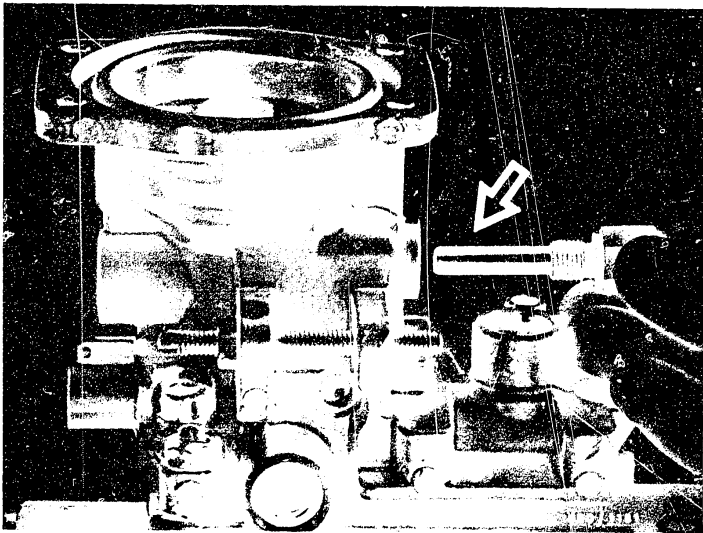
Provisionally mount the manifold-pressure compensator housing on the pump housing. Screw bearing bushing into manifold-pressure compensator housing to setting dimension "B" =  $7.5 + 0.5$  mm.

The lateral bore (see picture, arrow) thereby faces downward.

**K12**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





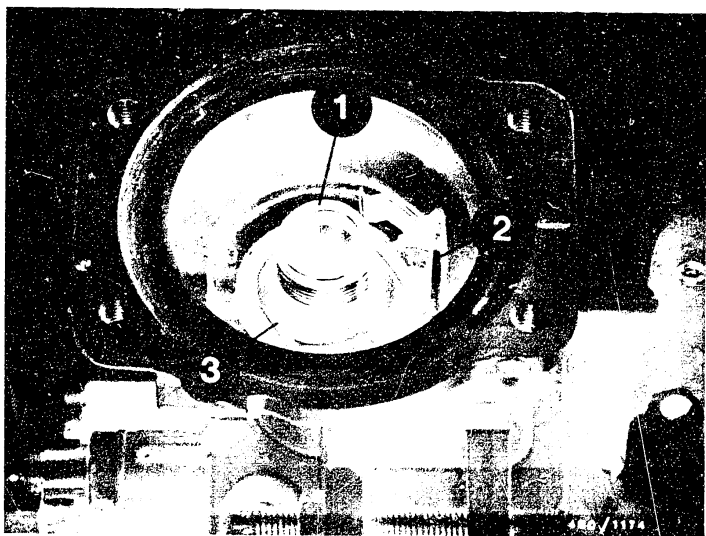
Housing bore of bearing bushing and lateral bores of bearing bushing must align with each other.

To check, depending on thread diameter, screw aligning pin KDEP 1103 or KDEP 1125 (see picture, arrow) fully into bore.

**K13**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





- 1 = Bearing bushing
- 2 = Locking piece
- 3 = Hexagon nut

Insert locking piece. Screw on hexagon nut and tighten to a torque of 25 ... 35 Nm.

Remove aligning pin.

Note:

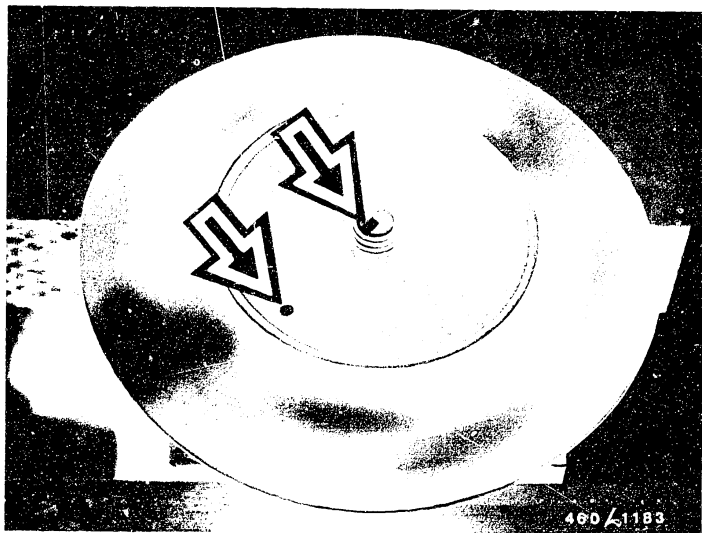
When mounting the bearing bushing and the hexagon nut, no dirt may drop into the bearing bushing or the space below it.

Check carefully.

**K14**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





### 12.3.2 Mounting the diaphragm

Clamp the sliding bolt in clamping fixture KDEP 1102.  
Thread points downward.

Put on plate washer.

Marking on plate washer thereby points downward. Place diaphragm on plate washer with bead pointing downward (see picture).

Place second plate washer on diaphragm.

Marking thereby points upward.

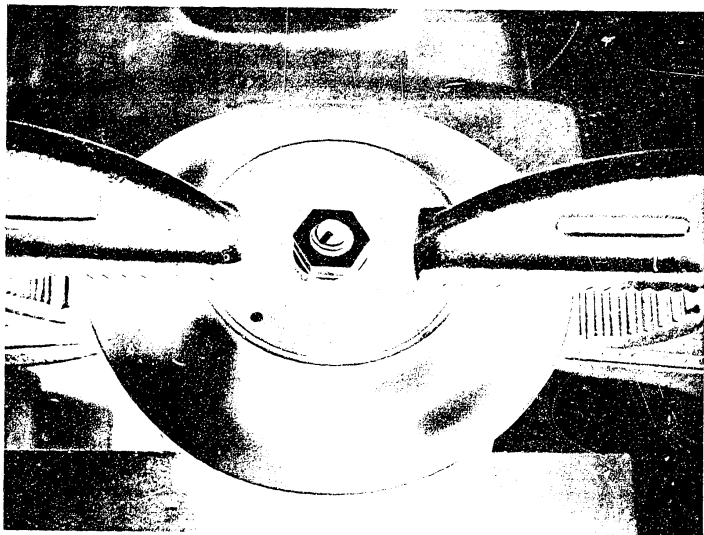
Turn upper plate washer so that the markings on plate washer and on head of sliding bolt align (see picture, arrows).

**K15**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..







Note:

Be sure not to damage the diaphragm during the following operation.

Clamp together both plate washers using small screw clamps or grip pliers (see picture).

This prevents plate washers from turning.

Position the spring washer.

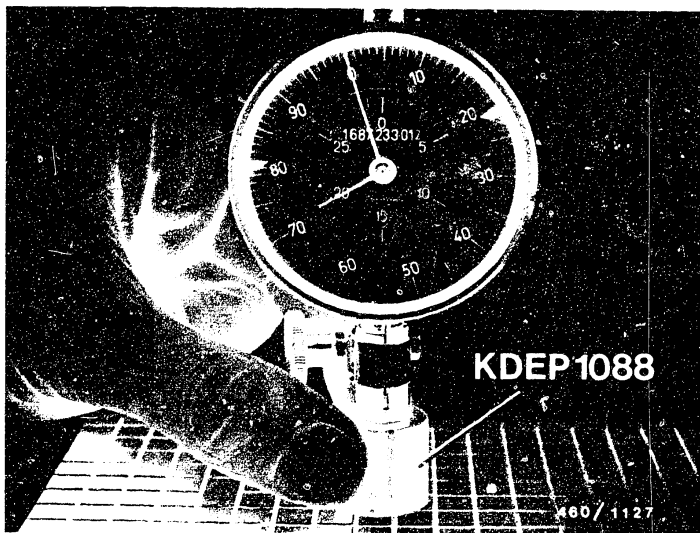
Screw on hexagon nut and tighten to 5 ... 6 Nm.

Remove screw clamps/grip pliers.

**K16**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





### 12.3.3 Establishing dimension "C"

Dimension "C" is the distance between the upper plate washer and the end face of the threaded pin (thread side).

Clamp dial indicator 1 687 233 012 with measuring insert in dial-indicator holder KDEP 1088.

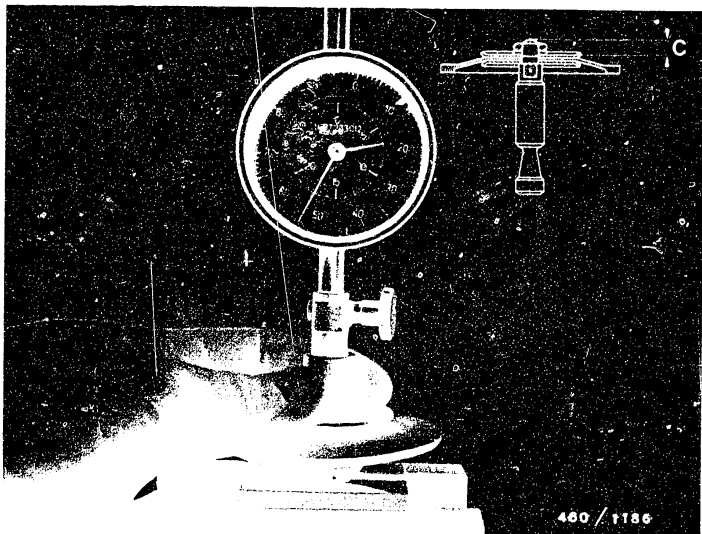
Place dial-indicator holder flat on marking-out board (test-bench bed).

Preload dial indicator by approx. 10 mm and set to "0".

**K17**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





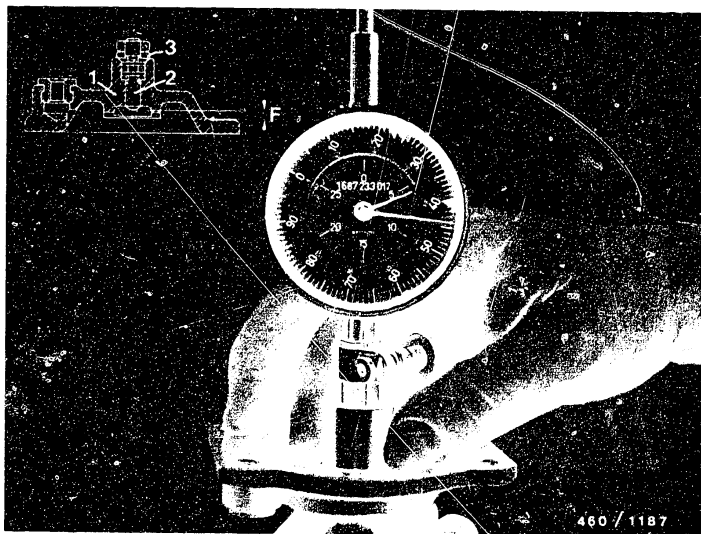
Place measuring tool on plate washer and read off dimension "C".

Make a note of dimension "C".

**K18**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Closing cover  
2 = Threaded pin

3 = Washer

#### 12.3.4 Establishing dimension "F"

Dimension "F" is the distance between the threaded pin and the end face of the closing cover (see inset at top left).

Check "zero position" of the preloaded dial indicator.  
Screw threaded pin with O-ring into manifold-pressure compensator closing cover.  
Place dial-indicator holder on closing cover.  
Measure dimension "F" with dial indicator.

$$F = C - 0.5 + 1.0 \text{ mm}$$

Set by turning the threaded pin.

Mount washer.

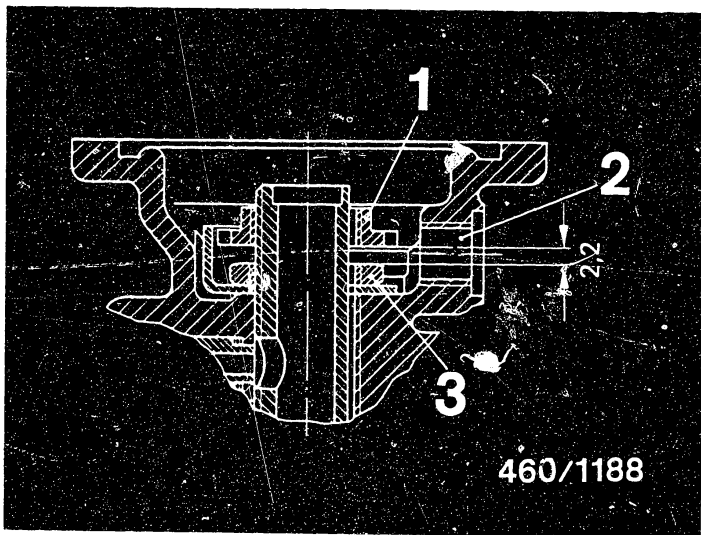
Screw on hexagon nut and tighten to 7 ... 9 Nm.

**K19**

Assembling manifold-pressure compensator

Distributor-type pump 0 460 4..





- 1 = Adjusting nut
- 2 = Bleeder screw
- 3 = Hexagon nut

#### 12.3.5 Presetting the adjusting nut

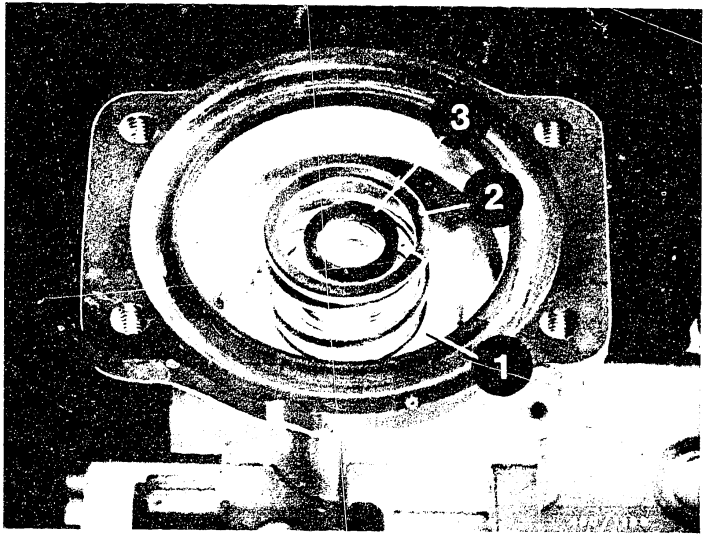
Screw in adjusting nut to 2.2 mm gap from the hexagon nut.

Set dimension 2.2 mm with feeler gauge (through bore of bleeder screw at adjusting nut).

**K20**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





- 1 = Adjusting nut
- 2 = Compression spring
- 3 = Spacer bushing

#### 12.3.6 Setting the manifold-pressure compensator stroke "H"

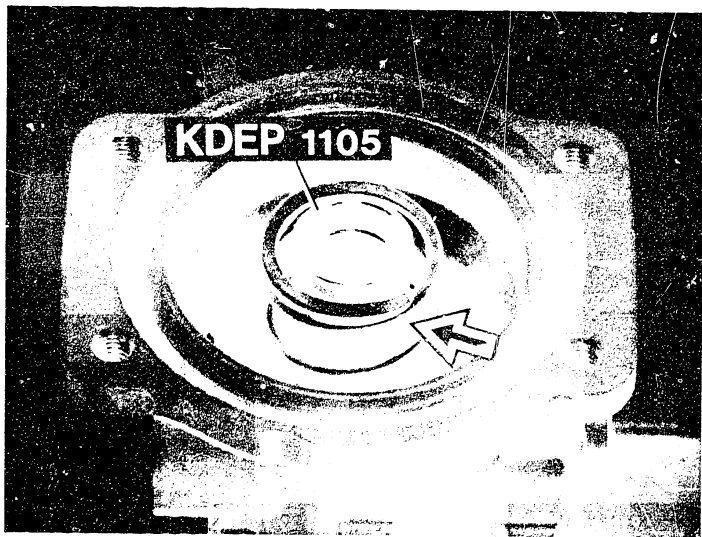
The stroke "H" is set by the height of the spacer bushing (dimension "E").

Measure up the spacer bushing.  
Place compression spring on adjusting nut.

**K21**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..



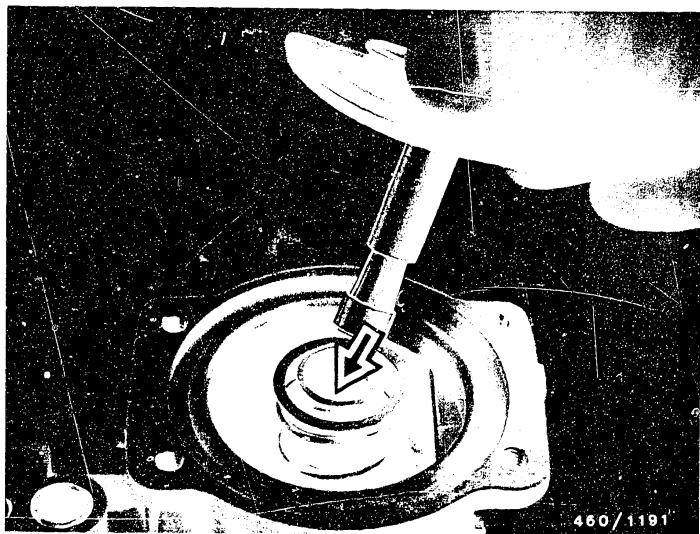


Pull measuring sleeve KDEP 1105 apart to approx. 12 mm and place with smaller diameter on bearing bushing (see picture, arrow).

**K22**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





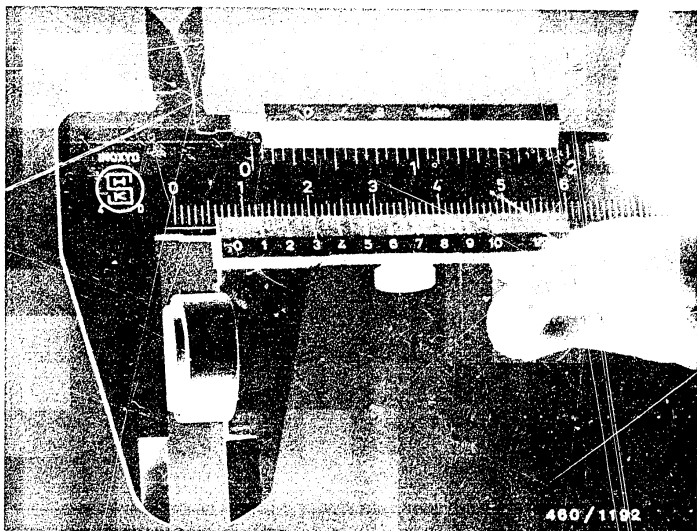
With diaphragm mounted, introduce sliding bolt into bearing bushing (see picture). Provisionally screw down manifold-pressure compensator closing cover and take off again.

**K23**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..







Remove sliding bolt with diaphragm.

Take measuring sleeve out of stop housing.

Measure length of measuring sleeve by means of caliper gauge (see picture). This yields dimension "G".

Do not press measuring sleeve together when doing this.

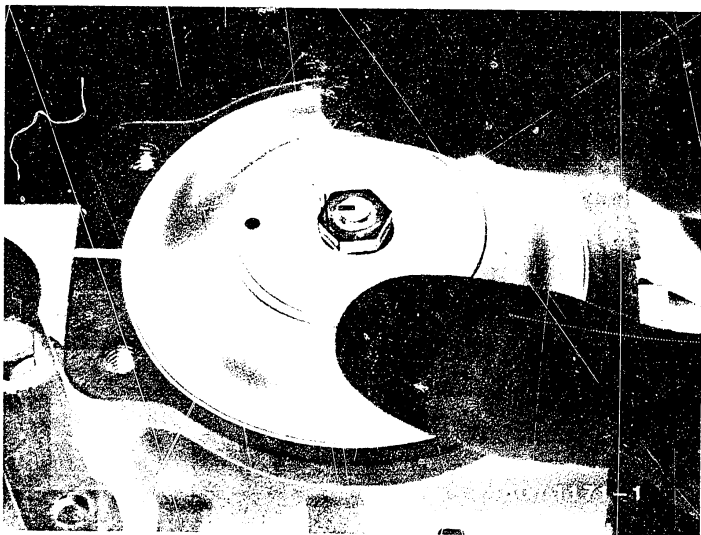
The height of the spacer sleeve - dimension "E" - results from:

$$\begin{aligned} & \text{Dimension G} \\ & - \text{Dimension H (see test-specification sheet)} \\ \hline & = \text{Dimension E (height of spacer sleeve)} \end{aligned}$$

**K24**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





Select correspondingly dimensioned spacer sleeve.

Coat sliding bolt with Molykote paste (Ft 70 v 1).

Place spacer sleeve on bearing bushing.

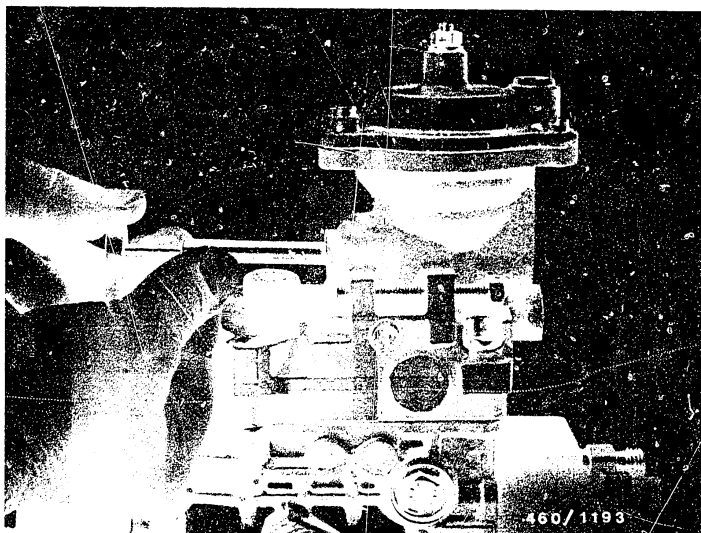
With diaphragm mounted, introduce sliding bolt into bearing bushing.

Turn sliding bolt in bearing bushing so that the marks on plate washer and housing (see picture, arrows) are in alignment.

**L1**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





Check the sliding bolt for freedom of movement.

Mount the closing cover.

Tighten fillister-head screws to 6 ... 8 Nm.

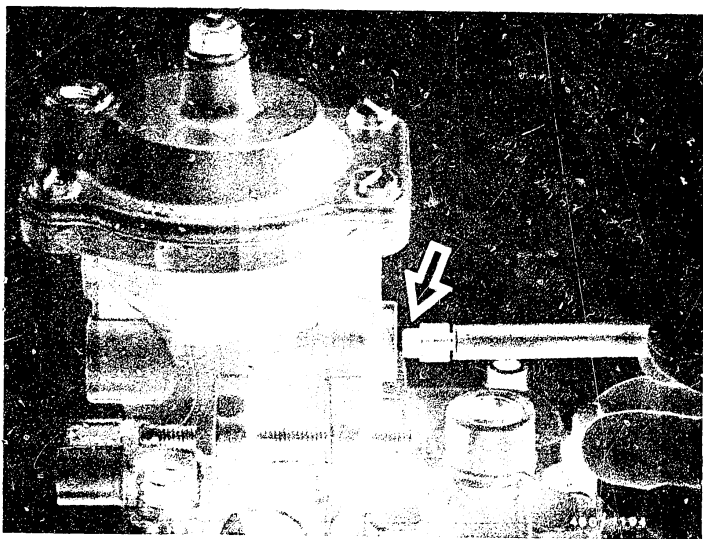
Slip on sleeve of puller KDEP 1104.

Insert O-ring in recess of bearing bushing.

**L2**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





### 12.3.7 Installing the bearing bushing

Put bearing bushing on puller KDEP 1104. The smaller diameter points toward the manifold-pressure compensator housing (see picture, arrow).

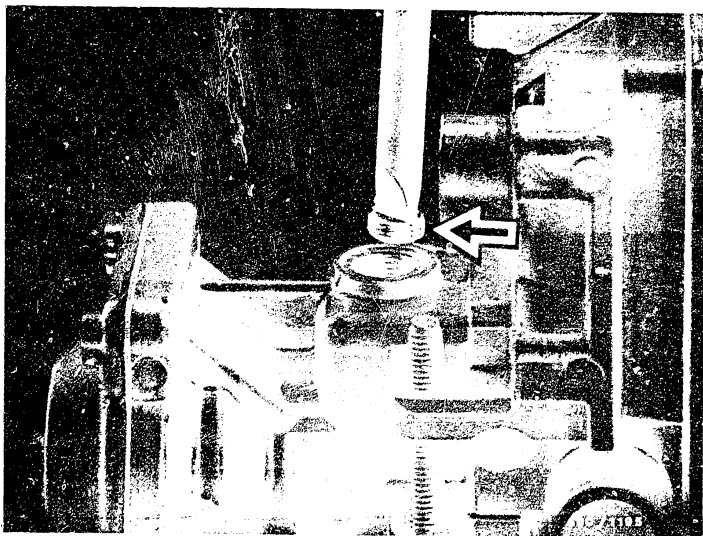
Slip on flat seal ring.

Introduce puller KDEP 1104 with bearing bushing into corresponding housing bore. Hold sleeve and pull puller out of bearing bushing. Then likewise pull out the sleeve.

**L3**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





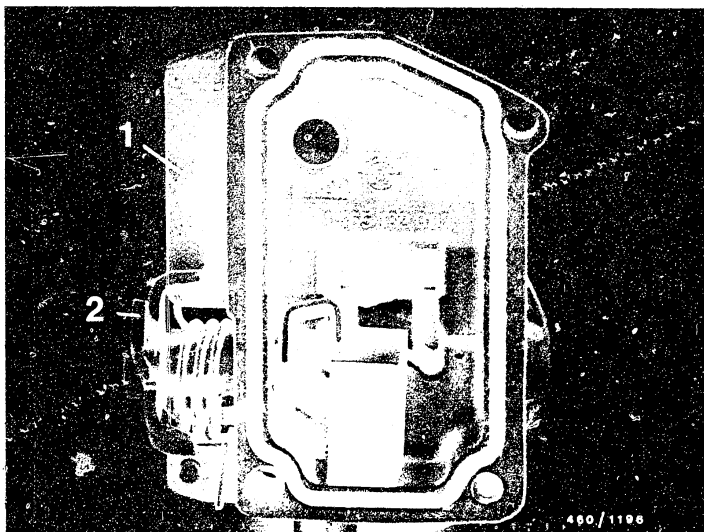
Pivot pump downward.

Screw in slotted round nut (see picture, arrow) with screwdriver bit KDEP 1090 and tighten to 9 ... 12 Nm.

**L4**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





- 1 = Manifold-pressure compensator housing  
2 = Stop lever

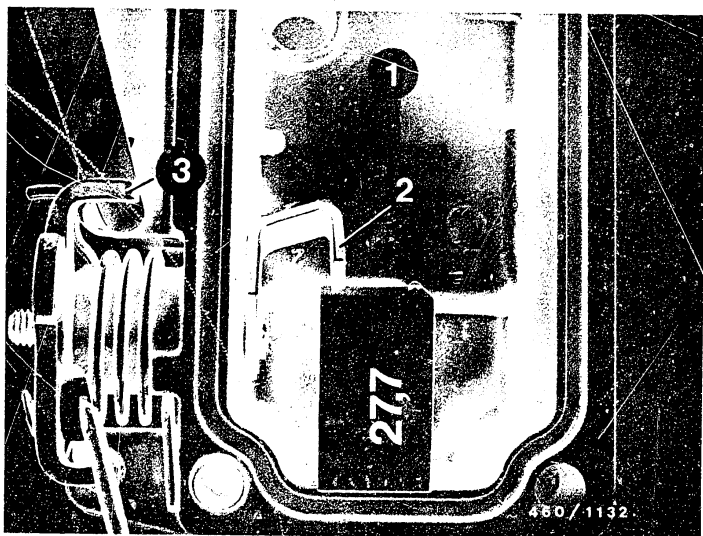
Place the pump in a horizontal position.  
Unscrew manifold-pressure compensator housing from pump housing. Mount stop lever and set in accordance with mark.

If the mounting position of the stop lever in relation to the lever shaft was not marked when removing, it is necessary to measure the relationship.

**L5**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





- 1 = Housing cover
- 2 = Lever shaft
- 3 = Regulating lever

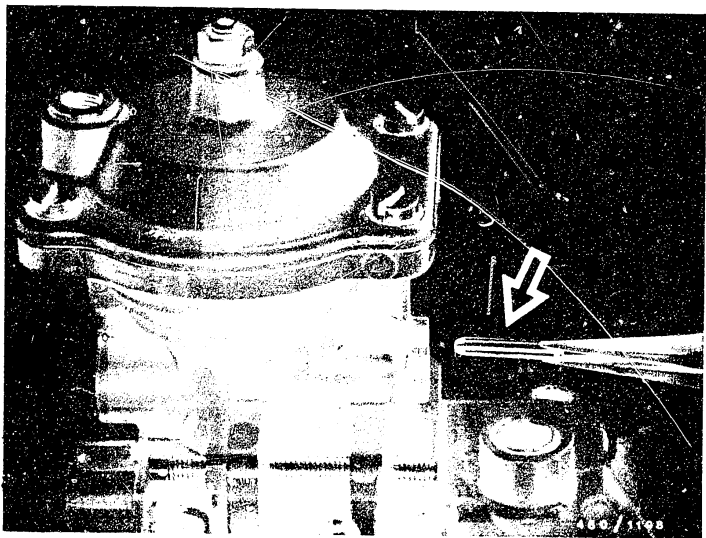
### 12.3.8 Setting the mechanical shutoff device (Measuring up the relationship).

Place spacer, 27.7 mm long, between inside edge of housing cover and inner stop lever (see picture). Mount control lever so that there is a gap of 2 ... 5 mm from the housing (measure with feeler gauge, see picture).

**L6**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





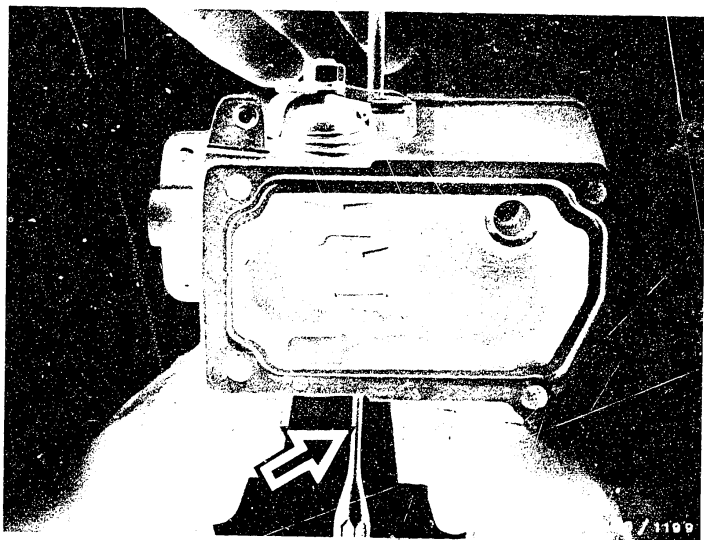
Coat guide pin (see picture, arrow) with Molykote paste (Ft 70 v 1) and introduce into bearing bushing. Smaller diameter to the front.

**L7**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..







Likewise coat the control lever with Molykote paste on the stop face for the guide pin.

Introduce control lever into stop housing.

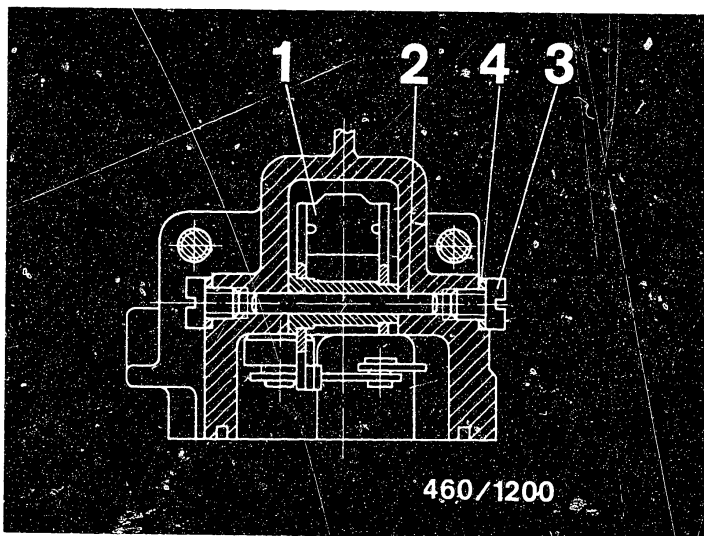
Note:

The locating of the control lever is made easier by holding with a drift (see picture, arrow).

**L8**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Control lever  
2 = Straight pin

3 = Fillister-head screws  
4 = Flat seal ring

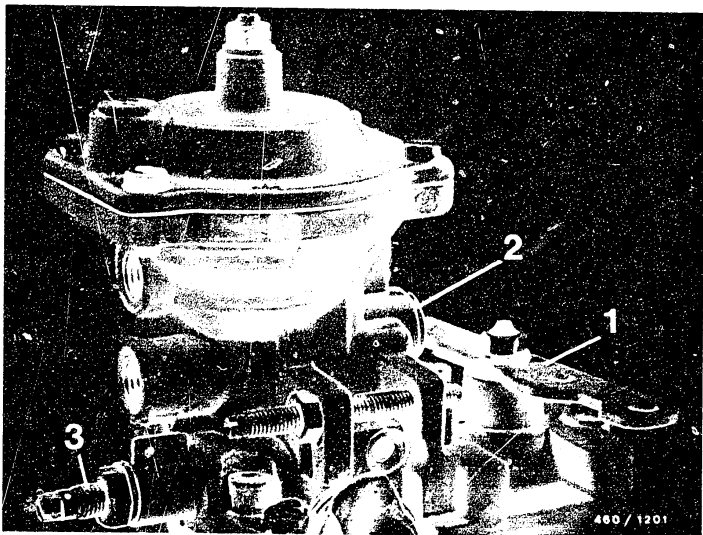
Drive in straight pin.

Mount fillister-head screws with flat seal ring and tighten to 6 ... 7 Nm.  
Check the control lever for freedom of movement.

**L9**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..





1 = Control lever  
2 = Screw plug

3 = Threaded pin

Mount screw plug with flat seal ring. Tighten to 10 ... 13 Nm.

Screw in threaded pin.

O-ring must be entirely in housing.

Mount control lever.

After repairing the manifold-pressure compensator, it is necessary to measure dimension "MS" in accordance with testing instructions.

Note:

Setting is not possible until after the full-load delivery setting has been completed.

Mount overflow restriction.

Remove injection pump from clamping support.

**L10**

Assembling manifold-pressure compensator

Distributor-type pump 0 460 4..



### 12.3.9 Oil fill - manifold-pressure compensator housing

After repairs have been completed, fill manifold-pressure compensator housing with sliding bolt 11 mm dia. with Shell Glavus G32, depending on the installation position of the pump in the engine.

<u>Installation position</u>	<u>Quantity of oil</u>
Pump laterally inclined	4.5 - 5.5 cm <sup>3</sup>
Pump vertical (Hydraulic head at top)	16 - 20 cm <sup>3</sup>
Pump horizontal	19 - 21 cm <sup>3</sup>

Manifold-pressure compensator housings with sliding bolt 12 mm dia. are not filled with oil.

#### Note:

To prevent oil losses during transport, the bleeder hose on the manifold-pressure compensator is closed with a clamp.

This clamp must be removed before the pump is started up on the engine.

**L11**

Assembling manifold-pressure compensator  
Distributor-type pump 0 460 4..



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